THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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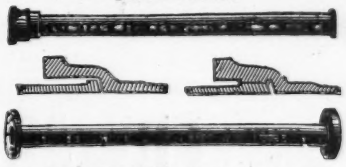

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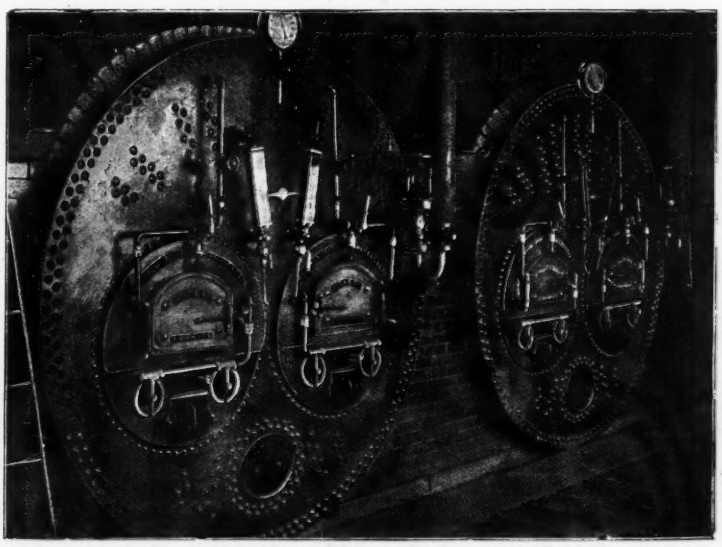

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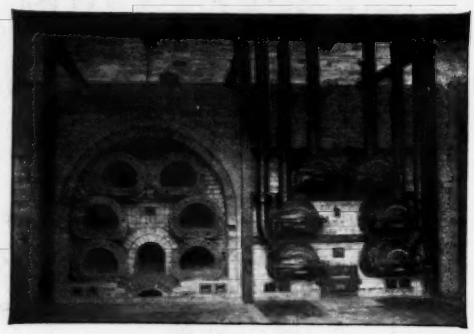

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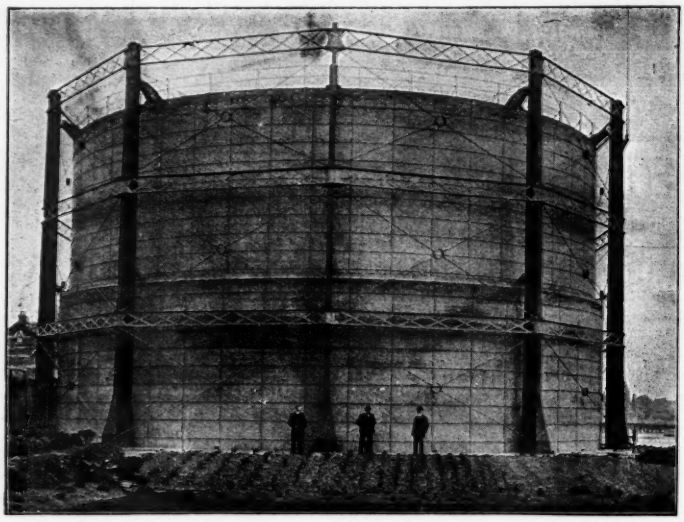

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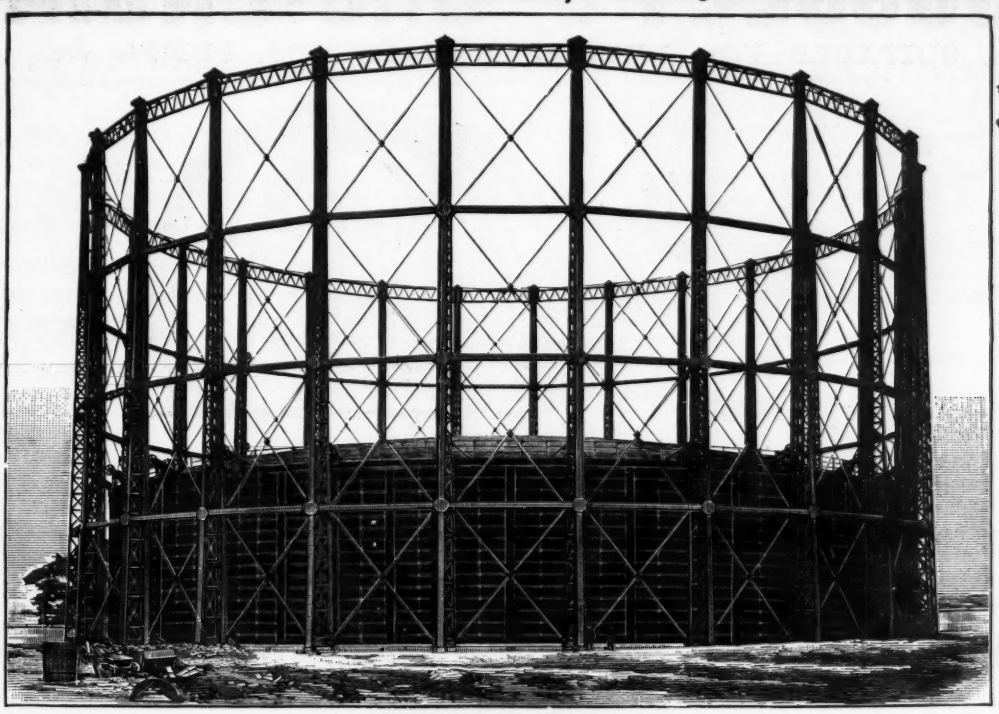

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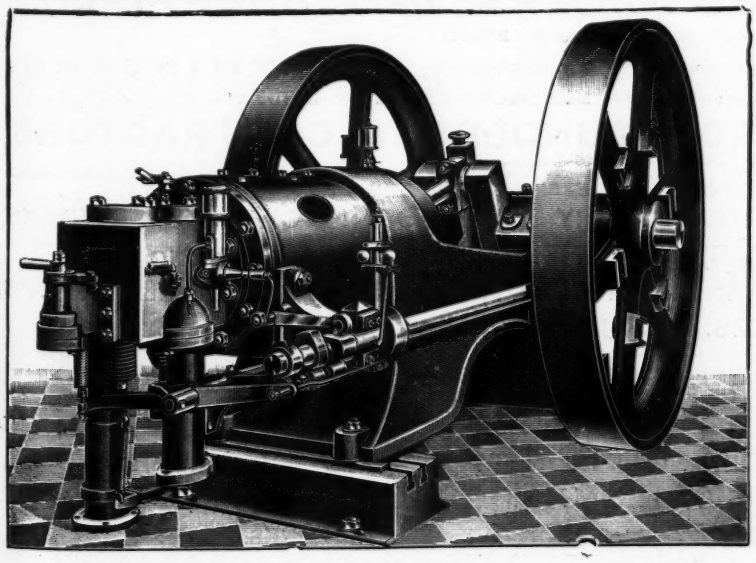

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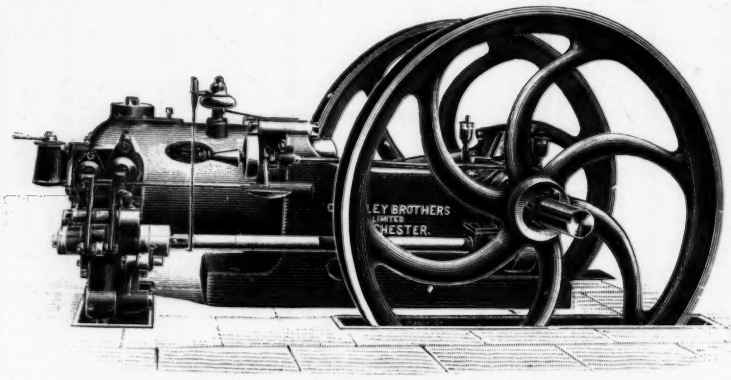

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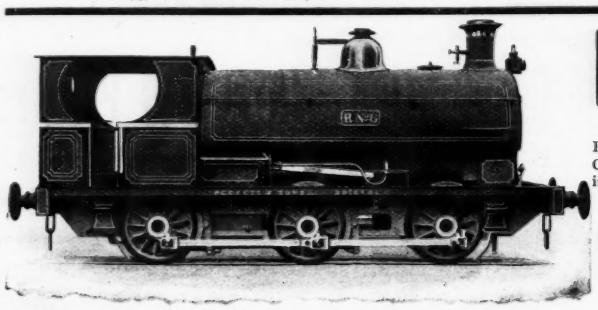

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Bockenheim, near Frankfort	29	261	Muehlhausen i. Th.	4	36
Bremen	30	270	Mailand (Milan)	24	216
Brooklyn (U.S.A.)	5	45	München-Gladbach (Munich)	8	72
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Charlottenburg	32	288	Plauen i. Voigtl	4	36
Chemnitz	19	171	Odense	9	72
Coblenz	13	117	Randers	4	36
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Danzig	10	90	Rostock	6	54
Dresden II.	14	126	Rixdorf	12	108
Dresden III.	10	90	Stettin	21	189
Drontheim	2	18	Stockholm	24	216
Esslingen	3	27	Strandvej	4	36
Elberfeld	5	45	Trieste	18	162
Frederiksberg	27	233	Winterthur	8	72
Flensburg	6	54	Witten	4	36
Gera	9	81	Wittkowitz	4	31
Genf	7	63	Wien (Vienna)	186	1674
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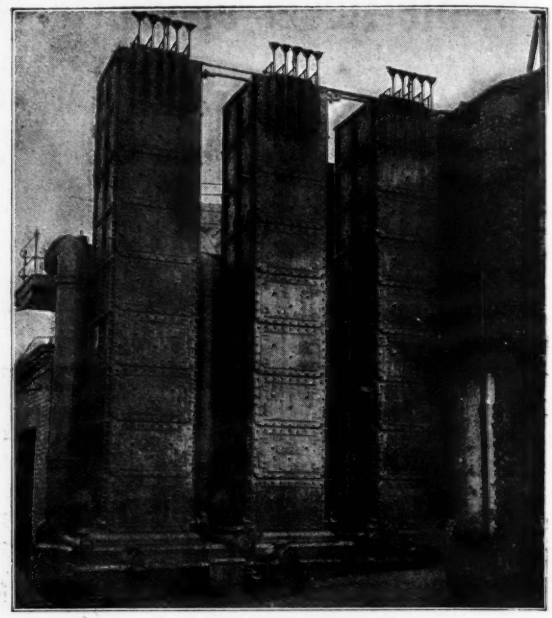

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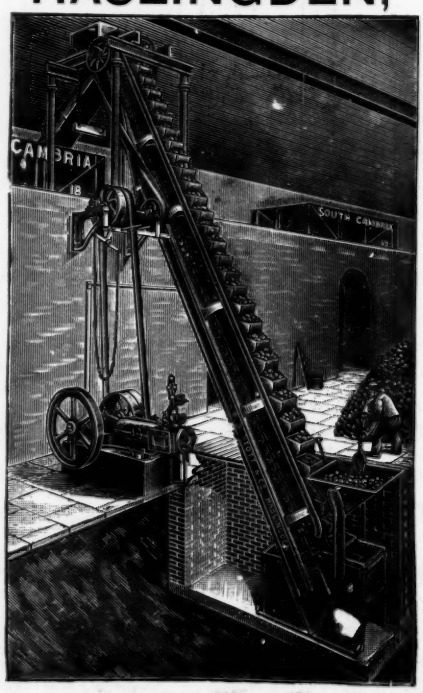

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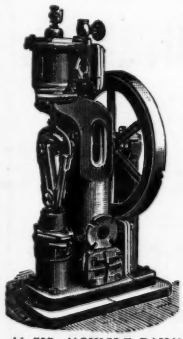

Fig. 705. "SINGLE RAM" STEAM-PUMP.

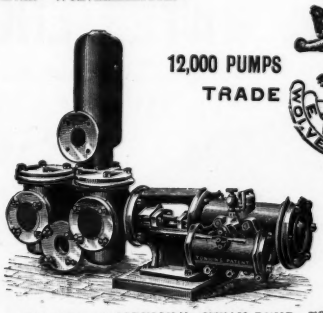

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

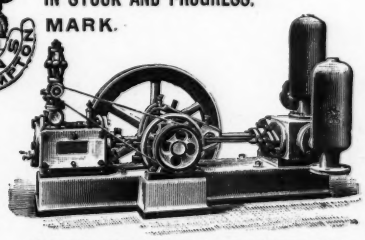

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

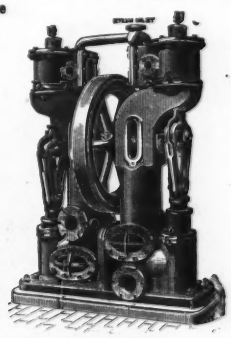

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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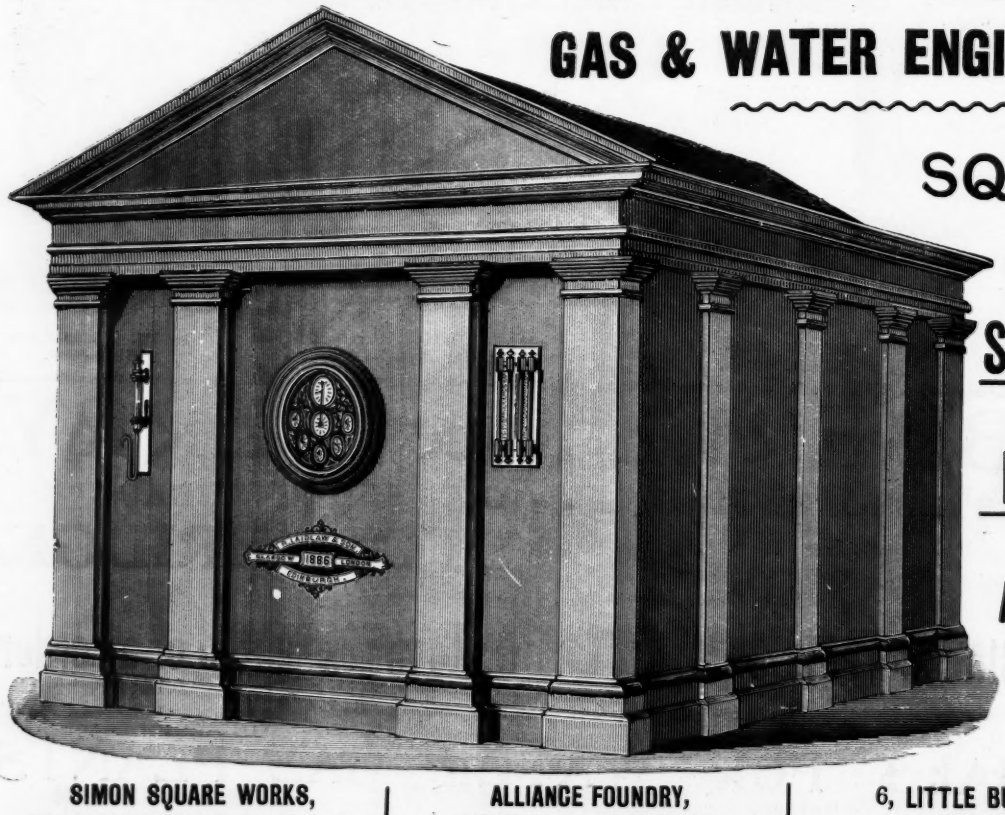

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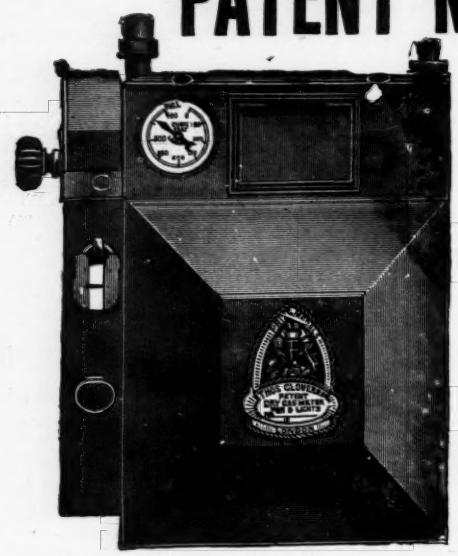

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EDITORIAL NOTES.

Employers' Interest in Lord Penrhyn's Case.

IT is greatly to be hoped that the result of Lord Penrhyn's libel action against Mr. Parry, who was last week cast in £500 damages, will help to finish a condition of affairs at the Bethesda quarries which was not only intolerable as regards the parties concerned, but was a standing menace to all large employers of labour. These troubles have been discussed here, because they arose out of a matter which really underlies and determines the conditions of employment everywhere, although it does not usually display itself upon the surface of the relations of employer and employed. We claim it as a distinction of the "JOURNAL's" treatment of all the industrial topics that have bulked so largely in the affairs of the world since about 1889, that, almost alone among organs of public opinion, we have from the first correctly diagnosed the true character of the disease of Trade Unionism, as being nothing short of an invasion of the right of property. Beginning speciously enough with an assertion of the right of combination, and proceeding to the exercise of the method of "collective bargaining," the new Trade Unionism differed from the old in being organized for nothing else than attack upon employers by means of the "strike." Many publicists were misled in regard to the nature of the new industrial movement by the fact of its first objects being simply the securing of higher wages and shorter hours of labour. It was not long, however, before the acknowledged aims of the New Unionism went far beyond questions of wages and working time, and proposed nothing short of an economic revolution, by which the "workers" were to have all the profits and powers of the individual employer, who was to be expropriated and extinguished. This development was due to the amalgamation of the theorists of Socialism with the practical forces of organized Labour, which came about at the period already referred to. The immediate sign of the change that was then brought about was the disappearance, as a factor in industry, of the "good employer." No such being was recognized by the new combination. To the Socialist, all employers were bad, simply because they represented that principle of private property in the industrial form which was *anathema* by their creed.

It is not too much to say that the public in general did not perceive what had come to pass in the industrial world for a long time after the new spirit had commenced to operate. A series of big strikes, for the "principle," eventually showed all but the wilfully blind that what the new socialistic Trade Unionism wanted was not the amelioration of the lot of the wage earner, but the disestablishment of the institution of private property. If the improvement of the workman's circumstances had been the goal of the movement, what has been achieved by the South Metropolitan and other benefit schemes in the way of the economic emancipation of the day labourer would have been received as at least a substantial instalment of the reward of its success. As a matter of fact, the indifference of the class intended to be benefited by such schemes to the endeavours of their employers to meet them half way, is chiefly accountable for the slowness of their growth in the land. All such devices which still retain the principle of the ownership of employers are at variance with the socialistic ideal.

The peculiar value of the Penrhyn dispute as a trial of strength between the parties to employment under the economic conditions which still rule in the civilized world, consists in the clearness with which the issue was set by the fact of the employer being also an individual proprietor. After all is said, the source of the trouble here was that Lord Penrhyn wished and intended to manage his property in his own way; and a good many of his employees, who used to be called servants, wanted to do it in theirs. The owner's way was better for his interest, and the men's was more profitable to them. There was nothing more than this not very wonderful difference between the parties, when it occurred to some to bring in the methods and resources of Trade Unionism to the assistance of one side. Lord Penrhyn "countered" in a way that proved effective; and bad blood was thus engendered. Mr. Parry made himself a champion of the malcontents, and defamed Lord Penrhyn personally in a manner for which he refused to apologize when given the opportunity for doing so. For this behaviour he has to pay smartly; and the best thing to be hoped for in the circumstances is that the lesson will help to restore peace to Bethesda, and teach prudence elsewhere.

Cheap Power Gas—Mr. Tobey Leads Off.

THE circumstance that, long before any practical success could be pointed to in respect of the Mond gas venture in South Staffordshire, a similar speculation has been launched in the North-West of England, is one that should not be overlooked by gas companies elsewhere. It is to be presumed that the proprietors of the gas interests threatened by this fresh project will not allow their ability to serve their public to be disparaged without a protest. But the chief interest of these schemes, for gas engineers, lies in the assumption of their promoters that they have the chance of staking out a "claim" which the older gas industry cannot occupy. It is more than probable that encouragement has been lent to the popularity of such an idea by the cast-iron business methods of suppliers of gas. How far this is so may be matter of opinion; but it is highly suggestive that, in respect to the one branch of a gas company's proper business—the sale of gas for power generation—there are these various and sundry competitors springing up on all sides. Supplementing what was remarked here on this head last week, we have since noticed a glowing account in the "Electrician" of the enterprise of the Trafford Park Power and Light Company, whose "claim" appears to have been carved out of the district of the Salford Corporation Gas Department. Let us see what is said for the Company by our enthusiastic contemporary. The locality and conditions for working are described as "almost ideal, and certainly "very exceptional." The station is plumped down amid a growing manufacturing district, where in many cases power is required for nearly 24 hours a day. It appears to enjoy the monopoly of supplying electricity for power and light, and power gas, within what was originally the Trafford Park Estate; and fuel is cheap. The Company are offering electric power at the price of 1½d. per unit for the first 1200 hours of maximum demand per annum, and ½d. per unit afterwards. These rates are commended as extremely low, and comparing "most favourably with any figures which "can be obtained by the use of steam or gas engines." The supply, we are told, has been quickly appropriated by many of the manufacturers whose works are situated in the locality, as well as for working cranes in the Ship Canal docks. The Salford Corporation appear to be "out of it," whether for gas or electricity.

This need not be; for the Company cannot have any "monopoly" outside their area. By the way, this low-price working of a "monopolist" Company may be commended to the notice of the newspaper gentlemen who usually argue that where there is a private monopoly there can be no cheapness. Why should this particular Company be able to beat the Salford Corporation? Those who could satisfactorily answer the question know something. Good men of business who have a little preserve of their own, do not press their advantage too hard. They try to keep their advantage by dealing fairly with the public. As regards the traffic in power, in Salford or elsewhere, there may not be a great deal of profit in it; but most of the trade ought to go to the gas undertaking. There may be uses, as in the case of travelling cranes, where electric power has the advantage of handiness over gas; but where there is no such consideration, ordinary gas ought to beat electricity in price as well as in adaptability. In connection with this contention, we congratulate the Directors of the Malton Gas Company and their alert Manager, Mr. Henry Tobey, upon

the innovation that they have made on the usual practice of statutory gas companies, as described in the letter which we publish to-day. As Mr. Tobey justly remarks, the cost of making gas to supply engines, mostly on day load, is not so great as the average for the whole output; and the drawback of overlapping with the lighting load is nothing where there is a gasholder. There is no doubt about his being able to make his new bargain pay; and others would find it advantageous to follow his example. Local circumstances must, of course, govern cases; but in most industrial centres a cut from the lighting rate of from 33 to 50 per cent. for power gas could be safely made.

We have also received a pertinent letter from Mr. George Helps, of Nuneaton, who is evidently unsettled in mind for the present as to the price at which he could sell gas for power purposes without loss. The answer to this query will be different for different places; and it can only be ascertained by taking full account of such considerations as were advanced by the Mayor of Stockport, as reported in last week's "JOURNAL" (p. 650). It needs hardly to be said that we do not advocate the sale of gas at a loss to any class of consumers.

Parliamentary Questions.

THE second readings of the two Bills affecting the Gaslight and Coke Company were again postponed, and now stand in the Orders for this evening's sitting. Meanwhile, the action of the Parliamentary Committee of the London County Council in calling upon the President of the Board of Trade to appoint a Departmental Committee with the object of relieving Parliament of the task of dealing with the gas technicalities of the year, was approved by the Council at their meeting last Tuesday. How the proposal strikes the Board of Trade remains matter for conjecture. We are not quite sure that even the County Council appreciate the situation. The present step has very much the appearance of a hole-and-corner proceeding. Followers of the transactions of the County Council might have vainly searched the usual channels of information last week to learn how the Parliamentary Committee's recommendation fared. Only those who regularly scan the weekly *agenda* paper of the Council could know what was in the wind; and, naturally, the issue was far too insignificant for the reporters to make a note of. This is precisely how the matter stands, however: The Council, having rushed into Parliament on their own account, and forced others to do so, upon highly controversial points of extreme technicality, are now running away from themselves. The specious device of calling in the Board of Trade is as clever as the elder Weller's recommendation of an "alleybi"—and just about as respectable. If the subject had been raised six months ago, before there was any question of parliamentary action, the course now proposed could not have been objected to in any quarter. The whole field of inquiry lay open, and nobody would have refused to take part in an unprejudiced investigation into the physical character of the best gas supply of London, and how the public could be satisfied that the Gas Companies were supplying a commodity of the nature and quality rightfully demanded by the purchaser. But that is not at all what the Council did. On the contrary, they took a side. They placarded their opinion that the South Metropolitan Company were not having their gas properly tested; and they stood by while the Gas Referees altered their table photometer and method of using the standard burner, to the special injury of the Commercial Gas Company. Then they promoted a Bill to make the Gaslight and Coke Company supply 14-candle instead of 16-candle gas, while actually at loggerheads with the other Companies as to what is 14-candle gas. Having done all this, they now want to escape behind the Board of Trade!

The attribute of impartiality has vanished both from the County Council and from the Gas Referees in the course of these preliminaries. In the circumstances, there is no tribunal lower than Parliament to which the Gas Companies can entrust their cause with confidence that it will be justly dealt with. The Council and the Referees have stultified themselves. What sort of Departmental Committee could the Board of Trade now nominate that would command the respect of all parties? Better a colonel, a squire, and a manufacturer, not one of whom knows a photometer from a degree Fahrenheit, than a handful of professors likely to be impressed with the professorial view of these matters already placed upon record. The last-named point covers the whole case. If neither the County Council nor the Referees had shown their hand, nobody would have suspected that it was anything but the cleanest of the clean. Now there is no doubt on the point. The South Metropolitan and the Commercial Companies know! Of course, our view is that of the Companies; but even on the assumption that the views of the Council and of the Referees as to what is signified by the quality of gas, and the manner of testing it, are the sounder, it is still clear that Parliament ought to pronounce upon them. Science has no professors superior to the Gas Referees; but the robust common sense of that variety of the British jury which is called a Select Committee of Parliament is no undue respecter of the professoriate.

In regard to topics of general parliamentary interest, the most striking event of the week is the return of Mr. W. Crooks, the Labour candidate, for the dockyard constituency of Woolwich. Many students of the electioneering side of politics have aired their views on this result; but there is one aspect of it which will appeal to our readers more than most others. This was a dockyard men's triumph, and was notoriously earned by the candidate who promised the men most. In the past, dockyard voters have been regarded as a class apart; and their suffrages have not always been esteemed as complimentary to those who received them. Bread-and-butter politics, pure and simple—or, not very pure or particularly simple—have always characterized the dockyarders; and the tradition appears to hold more firmly than ever. But how will it be when the same principle governs the election of members of local authorities, and very possibly of more members of Parliament than represent present-day Government employees? The prospect is not of the triumph of Socialism, but of the rule of pure, unadulterated selfishness. If the municipally employed and the municipally housed vote as the dockyard men did last week, the eventuality is one that will give trouble before all is done.

Mr. Glasgow's Denunciations.—A Protest.

IN this issue is published a second article by Mr. A. G. Glasgow, on the subject of "Blue Water Gas at Ilford—and "Elsewhere." In his first communication, this adept and racy writer was actively accusant, and involved in his impeachment all and sundry who have publicly differed from his particular views on the question of the relative merits of Blue Water Gas *v.* Carburetted Water Gas. In the present article, he makes his response to those correspondents who have chosen to notice his criticisms and to take up his challenge. In regard to the controversial part of the article and all that has preceded it in this fresh water-gas eruption, there is no occasion for us to intervene; it is preferable that it should now be fought out by those more intimately concerned, and by those (if they will) who have daily working experience in connection with the matters in dispute.

In what is about to be said here, there is no intention or desire to suppress the controversy; on the contrary, the gas profession generally, and ourselves, are as eager as Mr. Glasgow can be to arrive at the "true facts of the case." But we wish to make a few observations on the methods of trying to arrive at these facts. It has been represented to us by several gas engineers that, if our correspondent in his original article had been a little less assertive and accusatory, they would have gladly contributed to the controversy from their actual working and experiment, but that they have no particular fancy for exposing themselves to anyone's impassioned attacks for not agreeing *in toto* with his views—particularly when the opponent has such a large personal interest in the question as Mr. Glasgow. Even before our correspondent's first article was published, we regretted the tone of some of its main parts; and the representations referred to have confirmed this private judgment. In the present article, too, there are passages which—considering the relation of our correspondent to the gas profession—prudence should, we think, have restrained. "I also recog-"nize," says Mr. Glasgow, "that it is often possible—by "concentrating benzol enrichment to the time and district "of official testing—to reduce the quantity used to an appa-"rently economical limit, when distributed over the entire "bulk of gas, and yet escape penalties for deficient illumi-"nating power. I still further recognize that, instead of a "defection in quality (either calorific or illuminating) being "promptly visited upon the suppliers, it will primarily "result in an increased demand for gas." Then, again, the

"manager who tries to serve his proprietors by tricking his "customers is an opportunist of the worst character."

Whatever may have been the spirit in which Mr. Glasgow wrote these words, they have a caustic ring about them, and introduce rather ill-natured innuendo. We are indeed sorry that he should have included in his communications so much that is uncalled for, as our admiration for him as a controversialist in his own particular sphere, and when he limits himself to pure argument, is of the highest. We would go a step farther, and suggest that personalities between makers of competing types of plant should be avoided in further discussion of this subject. Criticize plant, working results, and published statements to any extent; but in a technical journal, correspondents should avoid such terms as "hypocrisy"—whether it is justified or not. In personal and trade disagreement of this kind, the gas profession have no interest. It is sufficient for a plain protest to have been made against the use, without qualification or explanation, of certain figures. On this point, it may be observed that in Mr. Brown's report on the test that was made with the Ilford water-gas plant as quoted in the article which has provoked the present controversy, all the items constituting the total of 3·48d. per 1000 cubic feet were set forth; and with these items before him, any gas engineer can readily estimate, from his own working, the necessary supplemental expenses to gauge the actual holder cost. In this respect, it cannot be admitted that Mr. Glasgow has accomplished any great end in bringing to light the fact that the final cost of blue water gas at Ilford (to use his own corrected figure) is 7½d., and not 3·48d.

A Plan for Inducing Efficiency in the Workman.

THE recently issued report of Lieut.-Col. Yorke, Chief Inspecting Officer of Railways to the Board of Trade, on the relative merits of the railway systems of England and America, does not by any means support the views of those good people who would have us adopt for this old-world little island of ours all the methods and policies that are, more or less, successful in the vast new world continent of America. (We are not to be mistaken as meaning that we have nothing to learn from America in respect to business policy and manufacturing methods—there is much that we may learn therefrom with advantage; but it is necessary to point out to some good people that a thing is not necessarily good because it is American, nor bad because it is British.) There is, however, one passage in Colonel Yorke's report that may well be studied by the administrators, not only of railway companies, but of other large industrial concerns on this side of the Atlantic. It is that referring to the mode of selecting the men for employment upon the railways, and the opportunities offered to them for advancement. In this respect, Colonel Yorke truly remarks, America is ahead of this country. In the States, every man is considered to be in the line of promotion, and is examined from time to time to see whether he has fitted himself for it. Applicants who fail on the first examination must within one year make written application to be re-examined. Those who fail on the second occasion are "dropped from the service." Flagmen, brakesmen, and firemen who do not apply for examination within five years are liable to be dismissed, as a person who cannot qualify for promotion from these ranks to that of conductor or engineman is not considered likely to do so later on, and is required to "make way for those who are "more capable and progressive."

What a commotion such a policy would cause if introduced into most works in this country, and what a transformation it would effect if it were carried out thoroughly! Yet what is there in it to which any honest workman should take exception? We should be interested to hear the Trade Union organizer's arguments against it—poor man, where would his occupation be if the individual workman came to find it paid better to do a good day's work for his money, and to put his heart into his work (as every man worth his salt would really prefer to do), than to mouch and shirk in order that he may not exceed the amount or excel the quality of work that the least efficient waster in the Union can or will do? The "Westminster Gazette," which (for a paper conducted by an exceptionally level-headed staff of writers) shows a strange incapacity to realize that Trade Unions are not—to put it mildly—an unqualified blessing to the working classes, naïvely remarks: "We do not know what our "railway servants or their Trade Unions would say to this "competitive method, but undoubtedly it keeps the service "very much alive, and opens a wider door to natural ability "than the comparatively stagnant system which obtains in "this country." Very evidently the writer does not perceive that the hostility of the Trade Unions which he clearly anticipates to the proposed competitive method, is condemned utterly by his description of what the result of introducing it would be. Of course the Trade Unions would prefer stagnation under their control to the activity and life induced by competition, which would benefit the individual workmen, but teach them the folly of Trade Union methods. But that is not an argument against the suggested change. Certainly, in this matter of encouraging individual initiative and self-improvement among their employees, the leaders of industry in this country have something to learn from our American cousins. They may also learn from them that it is better in the long run to resist an obstructive Union than suffer it for peace sake.

The Pending Fall in Coal.

THE statistics as to our foreign trade in iron and coal, contained in the Board of Trade returns for last month, the condition of the home coal and iron markets, and the practical certainty of a peaceful settlement of the labour difficulty in South Wales—for that is how we read the result of last week's conferences of the Miners' Federation of Great Britain—all furnish good reason to believe that the spring contracts for gas coal this year will be closed at a considerably lower figure than has been the case for some years past. The total exports of fuel for the month of February amounted to 4,534,843 tons, compared with 4,123,469 tons, and 3,694,500 tons in the corresponding month of 1902 and 1901 respectively. Of the increase (411,374 tons) over 1902, 295,000 tons went to the United States; and seeing that, in spite of this increase, the markets remain in a very languid condition, and that the latest reports from America (as well as the home markets) point to the demand from that quarter being virtually over—Boston Harbour is reported to contain vessels waiting to discharge nearly 100,000 tons of coal—it is obvious that when shipments across the Atlantic become more nearly normal, the British coal market will droop still further.

The exports of iron and steel continue very heavy—being far in excess of the figures for the past two years, and almost equal to the record shipments in the early months of 1900. But the home demand remains so quiet (especially where it is affected by the state of the shipbuilding trade), and the output of coal is so great, that the excess foreign demand—partly American and partly South African—is not sufficient to hold up the coal market, which is already described as "very quiet," "very much below the average," "dull," and so forth—many pits working short time for lack of orders. Altogether, the outlook is most promising, especially now that it is evident, as we felt sure would prove to be the case, that not even Mr. Pickard and his following will venture upon a general strike of British coalminers with a view to forcing the Welsh colliers and owners to tear up a draft agreement (highly favourable to the former, and conceded by the latter upon condition that it should be in force for at least three years) merely because the agreement would interfere with Mr. Pickard's projected manœuvres against the British coalowner at the end of the present year. The facts that the general public are obviously rather sick of Trade Union tactics, and that the recent decisions of the Courts have put a wholesome fear of the law into the Union officials, doubtless had much to do with the "strategic move "to the rear" of the Miners' Federation. The result, at any rate, is highly satisfactory to the intending coal buyer. We shall be very much surprised if the coalowners get anything like as good terms as they did twelve months ago.

The Bermondsey Clause.

Since the insertion last year, at the instance of the South Metropolitan Gas Company, in the Bermondsey Electric Lighting Order of the now well-known clause by which it was enacted that the charges for the supply of energy should be fixed at such rates that the revenue should meet the expenditure, large ratepayers all over the country have been agitating for the insertion of a similar safeguard in the Orders affecting their districts. In

the accounts of the proceedings of out-of-the-way district councils, we see the "Bermondsey clause" referred to as familiarly as if it had been with us for years, instead of about eight months. And not without reason has it risen so rapidly into fame, for it is just such a clause as is needed for the protection of the large ratepayers wherever the local authorities happen to be afflicted with that very common disorder "electric lighting fever." In this connection, the lot of gas companies is, of course, a particularly hard one; for they are frequently compelled (however much against their will) to assist in the financing of competitors who, thanks to such help, are able to sell the opposition light at less than cost price. This is adding insult to injury with a vengeance; and we are not surprised to find that gas companies are working hard to secure the application of the protective clause to the districts which they serve. Many instances of this have come under notice; and we have reason to believe that the Board of Trade contemplate the holding of an inquiry of a more or less general character, in order that they may determine what course to adopt with regard to the question. Doubtless the result of such an inquiry will be the drafting of a clause for insertion in all Electric Lighting Orders granted by the Board; and we trust no time will be lost in arriving at a decision upon the matter.

Gas Matters in Sheffield.

In his speech to the proprietors at the recent half-yearly meeting, the Chairman of the Sheffield United Gas Company (Sir F. T. Mappin, Bart., M.P.), had two reductions to announce. The first of these was an important, and very welcome one; while the second was unimportant and easily explained. As from the end of the present quarter, the price of gas will be reduced by a further 2d. per 1000 cubic feet, which will bring it back to the lowest figure ever charged in the city. The second reduction referred to a trifling falling off in the amount of gas sold during the last half of the past year; but this the Chairman pointed out was accounted for by the fact that the Company had sold double the quantity of incandescent burners during the period under review to what they had disposed of in any previous six months, while other traders had doubtless experienced a similar increase in business. Inasmuch as the use of incandescent gaslights cannot fail to give greater satisfaction to the consumers than did the displaced flat-flame burners—thus largely strengthening the position of the Company—it is impossible to regret the slight diminution in the output arising from this cause. Every incandescent burner sold is an additional barrier placed in the way of the electric light, whose competition therefore becomes less and less to be feared by the Company as the number in use increases. So long as this is the only cause of a falling off in consumption, there is no need for shareholders to have the slightest misgiving with regard to the stability of the business of the Sheffield gas undertaking.

Gas v. Electricity for Railway Stations.

Sir Frederick Mappin is a splendid example of the fighting Chairman; and his remarks to the proprietors of the Sheffield Gas Company are never without interest. Comparisons appear to be one of his strongest points. A year ago, the Manchester and Nottingham gas undertakings were utilized for this purpose; while last September the Sheffield Corporation arc lighting was favoured in the same respect. And now he has provided ample food for reflection on the part of those Railway Companies who use electricity for the lighting of their stations rather than incandescent gas. The figures compiled are remarkable; and after perusing them, we can only wonder with Sir Frederick why it is the Companies referred to persist in such a useless expenditure of hard-earned money. Eleven of the stations of the Midland Railway Company, more or less like Sheffield which are lighted by electricity cost, for six months of 1901 and the same half of 1902, £53,820; while sixteen stations in and around Sheffield which were lighted by gas cost £3176 for twelve months. Of the huge sum named for electricity, no less than £3855 was for lighting part of a Sheffield goods station, as against a charge of £727 for the lighting of the passenger station by gas for twelve months. Thus sixteen stations are lighted by gas at a considerably smaller outlay than is incurred in the partial illumination of one goods station alone by means of electricity—and this in spite of the fact that the Railway Company generate their own current. This is not theory, but practice; and the Railway Companies concerned should be grateful to Sir Frederick for pointing out to them a means by which great economy may be effected, without the possibility of any loss of efficiency. Whether or not there are any "extenuating circumstances" to be urged on behalf of electricity, there must remain an enormous balance of advantage as regards cost in favour of gas. The present condition of English railway finance cannot be held to justify the employment of such an expensive luxury as electricity, when it does nothing whatever to attract additional custom to the various lines. It has been claimed for the electric light (chiefly by interested parties) that it possesses many virtues; but we have never yet heard anyone contend that passengers have been induced to travel on a particular railway system because the stations are lighted by electricity, or that goods traffic has been influenced by the same consideration. This being so, and the suitability of incandescent gas for the lighting of such structures being unchallenged, the question of cost should be the deciding factor in the choice of an illuminant. In arguing this matter in the proper quarters, gas managers will find Sir Frederick Mappin's figures of considerable use. Truly the speeches of the Chairman of the Sheffield Gas Company are of more than local interest.

A Feathered Lamplighter.

A correspondent has sent us an account of an interesting puzzle and its solution, which may be of assistance to others who are troubled with vagaries on the part of their public lamps. In the case in point, a lamp was several times noticed to be out when it should have been alight; but, on the other hand, for two or three weeks it was seen blazing away nearly all day. Then it took to lighting up and going out two or three times in one day; and once it was actually seen to light up while not a soul was anywhere near. An investigation of the matter revealed the fact that the chains of the bye-pass moved so easily that a mere touch would send them up or down; though they could not move of their own weight or by the wind. It was then remembered that last year a pair of wrens built their nest inside the lamp-post, and reared a brood there; so a watch was kept and at last one of the birds was seen to fly to the lamp, perch on the ring at the end of the chain, and do the trick! Here is a simple solution of a problem which at first sight had quite an uncanny appearance about it. If the bird could only be taught to turn the gas on and off at the proper times, it would be quite a useful addition to the gas-works staff; but that, perhaps, is too much to expect.

Councillors' Refreshers.

Feathers were flying at last week's meeting of the Bradford City Council, when a long (and at times very acrimonious) discussion took place upon certain "customs" which prevail in connection with the Corporation Committees. The proceedings were amusing, and they would have been more so had it not been for the fact that a most important principle was involved. The debate had reference to the pernicious habit of turning what should be simply and solely business gatherings into small "beanfeasts;" the amount of time and money spent upon attending to the needs of the inner man—*i.e.*, jollification—being sometimes altogether out of proportion to the magnitude of the work on hand. On one occasion, a Sub-Committee engaged in the stupendous task of "buying a bay mare" totted up a comfortable little account of £2 1s. 6d. for "incidentals;" while another similar Committee incurred an outlay of £2 15s. 6d. (of which, be it mentioned, the goodly proportion of £2 7s. 11d. represented a bill at the Great Northern Hotel) on the examination of a quantity of oats. There is, perhaps, no particular harm done by these outings; and the amount they cost the ratepayers is not worth serious consideration. That, however, is not the point. A man who seeks municipal honours is supposed to serve his fellow townsmen as a councillor without fee or reward; and this he should do. He need give nothing beyond his time and attention; but, on the other hand, he should seek to derive nothing from it except honour. An occasional dinner and a free cab ride cannot, it is true, be considered as payment for the services rendered by councillors; but unnecessary indulgence in them cannot be defended on any ground whatever. And at Bradford, it is said, expense is frequently incurred in this way when there is no real need for it—as witness the occasion of the examination of the oats, when the

business transacted took about half an hour, and 6s. was charged for cheese, 24s. for wines, and 5s. for cigars. We are sorry to see the Gas Committee mentioned by a worthy Alderman as being among the culprits. This Committee, he averred, whenever they consider it necessary to go into the streets to see if further lamps are required, always start their proceedings with "high tea," with liquid refreshments and cigars to follow, cabs and any other requisite vehicles, and various occasions to "liquor up" during the expedition. Another councillor remarked that if the members were not worth their keep while working for the Corporation, the sooner they discharged them and got men who were, the better it would be for the city. This, however, is altogether beside the matter. The question at issue is not the value of the work done by the Councillors. It is entirely one of principle; and we are glad to see that a real stand is at last being made against this feasting at the public expense whenever the smallest excuse for it can be found.

Municipal Insurance.

A great deal has lately been said and written on the subject of municipal insurance; and a mutual scheme in which fifteen London Authorities are concerned has now been registered, under the title of the Municipal Mutual Insurance, Limited. Other Metropolitan Authorities are considering the proposal; and the idea has also aroused much interest in the Provinces. We learn from the "Financial Times" that the London Authorities who have started the scheme are at the present time insured for about £3,000,000, at annual premiums amounting to £3000, the whole of which will be transferred to the new Board. It is not proposed to retain more than £5000 on any one risk; and it is said that very satisfactory arrangements have been made with two well-known non-tariff Insurance Companies for underwriting the risks. Every insuring Authority whose risk is £10,000 or over will be entitled to send a delegate trustee to the Board; and the voting power of the trustees will be regulated by the amount of risk they represent. It is intended to begin business as soon as possible; and a board meeting of the trustees has already been held. The Company has no capital or shares, but will depend solely upon the mutual guarantee of the members; and business will at first be confined to fire insurance, until a sufficient fund has been established for taking any other risks that may subsequently be thought advisable. Counsel's opinion is to the effect that municipal authorities can enter into a scheme for mutual insurance on the lines indicated without an Act of Parliament. Security is obtained by each Authority agreeing to continue its policies with the Company for five years—the premium to be increased or decreased as the result of the scheme warrants—combined with a safe proportion of underwriting, to avoid any heavy increase in premiums in case of loss. The proportion payable by the Company, even in the event of the total destruction of the largest property insured, will not absorb two years' premiums; while at the same time such a large profit is allowed to the Company by the underwriters that it is estimated more than half the gross premiums will be available for a reserve fund. No dividend or profit will be paid; the advantage looked for being a gradual reduction of premiums until the minimum rate of loss is reached, which is found to be about 4d. for every £100 insured. It is proposed to take over all policies upon the same premiums and conditions as to commission, &c., as now exist; and new insurances will be assessed at the lowest rates paid by the insuring authority for other similar risks. The scheme, however, ambitious as it is, does not exhaust the aims of the new concern; for it is intended to invest the reserve funds in municipal stock, and, as the scheme grows, to underwrite or assist in placing such stock on the most favourable terms. How far the advantages anticipated will be realized, must be left to the future to show; but this move on the part of our active municipalities seriously threatens the tariff Insurance Offices.

At a recent meeting of the Manchester Geological and Mining Society, a paper was read by Mr. W. Pickstone on "Underground Water Supplies," in the course of which he expressed the opinion that all the watersheds of the country should be under the control of a Government Department. The first necessity of our continued existence as a nation should, he said, be removed beyond individual control and individual emolument.

WATER AFFAIRS.

Starting the Metropolitan Water Board.

At the close of the article, in the last number of the "Journal," dealing with the announcement by the Court of Arbitration under the Metropolis Water Act, 1902, of their method of procedure, the suggestion was made that probably the next step in this matter would be an intimation of the completion of the constitution of the Water Board. We have not had to wait long for it, as the full list of the members was published on Friday morning, and it will be found elsewhere. It was accompanied by a letter from the Permanent Secretary of the Local Government Board (Sir S. B. Provis), summoning the members to their first meeting, to be held in the Council Chamber of the Privy Council on the 2nd prox. This action on the part of the Board is in virtue of the power conferred by clause 28 of the third schedule to the Act, which also places upon them the duty of regulating the proceedings at that meeting. Accordingly, the members are informed that their first business will be to elect a temporary Chairman; and they will next have to determine whether the permanent occupant of this responsible position, as well as the Vice-Chairman, is to receive a salary, and fix the amount; appoint persons to these offices, and likewise a temporary Clerk. It is anticipated that the selection of gentlemen to direct the proceedings of the Board may require more time than will be available on the occasion of the first assembly of the members, and therefore Sir S. B. Provis points out that it need not necessarily be done then; but it certainly must not be deferred beyond an adjournment. The power of the Local Government Board in regard to regulating the business of the Water Board is restricted to the first assembly; but as an adjournment is practically a continuation of the prior proceedings, the jurisdiction of the Department extends to that, and to no other meeting. The Chairman and Vice-Chairman must be chosen promptly, and the former will immediately take control. Assuming that these appointments are not made until the adjourned meeting—say after the interval of a week—there will not be much time for getting into working order before the Court of Arbitration commence their sittings, when the copies of the Companies' statements will come before them. It should, however, be sufficient for arranging preliminaries and official details, and preparing for serious work. The Board is large, and among its members are some who will have much to learn in regard to the important business of supplying this great Metropolis with water. It is to be hoped they will judiciously refrain from occupying time with speeches until they have obtained something like the grasp of this subject which certain of their colleagues unquestionably possess.

The Use of Natural Gas in America.—It is estimated that about 8,000,000 tons of coal were saved in the United States last year by the use of natural gas, of which $27,000,000 worth was consumed.

Eastern Counties Gas Managers' Association.—The next meeting of the Association has been fixed for April 22 at King's Lynn. The programme is not yet completed; but it will in due course be issued to the members by the Hon. Secretary, Mr. T. A. Guyatt, of Ely.

Gas from Lignite.—Laboratory experiments in connection with the production of gas from lignite have made it possible to construct a generator which will permit of its profitable manufacture on a commercial scale. According to some particulars contained in the "Revue des Produits Chimiques" for the current month, the gas is colourless, has a slight odour of benzine, and a specific gravity less than that of coal gas. It is a mixture of different gases, some simple, like hydrogen and nitrogen, the others hydrocarbons, methane, ethylene, and carbonic oxide. All are combustible except nitrogen; and, in order to burn completely, they require 1¼ times their volume of air. A specially constructed burner makes it possible to utilize this gas for all heating appliances. A cubic mètre (35·3 cubic feet) of it has 1556 calories. The flame is slightly visible, and has a very high temperature; thus giving phenomena of incandescence much more intense than those from other gases with a greater heat of combustion. This is to be noted, because it makes the gas utilizable for many purposes apart from engines, for which it can be employed like coal gas. It is hoped that in the not distant future it will be possible to turn to account the magnificent lignite deposits which are to be found all over France.

ESSAYS AND REVIEWS.

CONSOLATION FOR DISSATISFIED GAS CONSUMERS IN VIENNA.

It appears from recent revelations in the Vienna newspapers that gas consumers in the city are finding municipal gas a more expensive article than that formerly dispensed to them by the Imperial Continental Gas Association—notwithstanding that the price of the commodity is nominally unaltered. Complaints are general that from 10 to 15 per cent. more gas is now consumed than formerly under similar conditions. So, lest invidious comparisons should be drawn, the apologists for the Municipal gas undertaking have detailed one, Herr Carl Spitzer, an Engineer, to send the following amusing explanation of the increased consumption to the "Neue Freie Presse" for the edification of those who find that they have to pay for the honour and glory of consuming gas from "the largest retort-house in the world" (*pace* the journalist whose paragraph in our daily papers has lately erroneously so described the new Granton retort-house!) in the shape of heavier gas bills. Herr Spitzer's communication is so carefully elaborated with a view to appealing to those whose knowledge is inadequate to detect the technical fallacy on which it is based, that our readers' appreciation of its merit would be spoilt if it were not reproduced in its entirety. We therefore give a simple translation of it.

For some time past, the consumers of municipal gas, especially those living in the more low-lying districts of Vienna, have made the observation that their gas accounts have become considerably higher—by 10 to 15 per cent. on the average—compared with the corresponding months of former years, though the number of burners, and the times they have been alight, have remained the same as before. At first glance, it seems incomprehensible why the gas account should be higher, as, on the one hand, the price of 19 heller per cubic metre (= 4s. 6d. per 1000 cubic feet) of gas has remained the same as it was when the English concern supplied the gas; and on the other hand, the number and burning hours of the burners in use have not been changed. The following physical consideration will afford an explanation of this anomaly: The quantity of gas consumed by us is measured by means of a gas-meter situated at the place of consumption. For comprehending the following, it must now be stated that the gas-meter, in virtue of its mechanism, measures only the quantity of gas consumed by its volume (*i.e.*, in litres or cubic metres), and takes no account of the density of the gas, and of the pressure under which it is. Its operation depends on the principle that a drum dipping more than half into water in the case of the gas-meter is put in rotation by the gas which flows into the case from the main tap. The gas thus reaches the measuring chamber above the water level, whence it passes, by means of the service-pipes, directly to the burners. Now, since the volume of gas which reaches the measuring chamber at every revolution of the drum is known exactly, it is evident that the number of revolutions of the drum, which are registered by a counter, gives the volume of gas which is passed into the measuring chamber, and delivered thence to the burners, directly in cubic metres.

The delivery to the burners takes place only as long as any one point on the service is open. When this is not the case, as when all the burner taps are shut, there is no delivery of gas from the measuring chamber, and, consequently, there is no subsequent passage of gas from the main tap into the gas-meter, and no revolving of the drum. The gas-meter remains, so to say, at rest, which means that no further consumption of gas is being reckoned to us by the gas-meter. So far all would be in order, if Mariotte's law did not teach us that in any consumption of gas not merely the volume of the gas, but also its pressure, has to be taken into account. According to this law, gas volumes are inversely proportional to one another as the gas pressures—that is to say, the higher the pressure under which the gas is, the smaller is its volume. Herein lies the explanation of the statement made at the outset. The gas-meter measures, as above explained, only the volume—that is to say, there is always given at one revolution of the drum the same volume; such as, for instance, 1 cubic metre of gas. In this cubic metre of gas however, the gas can be at higher or lower pressure; so that by one revolution of the drum at the higher gas pressure, a larger quantity of gas is delivered in the measuring chamber, and at the lower gas pressure a smaller quantity. As the gas consumption is constant with the burners giving a proper flame, it is evident that from unit volume these burners can be supplied so much the longer with gas, the greater is the pressure of the gas contained in this unit volume. Conversely, the same flames will be able to be supplied for so much shorter a time the lower is the gas pressure—that is to say, so much the more gas will be consumed the lower is the gas pressure.

Describing these occurrences in popular language, the fact is arrived at that, in 1 cubic metre of gas supplied through the gas-meter, there is a so much smaller quantity of gas the lower is the gas pressure. There must therefore issue from the measuring chamber for the supply of the burners so much more gas the lower the gas pressure is. Therefore more gas must also pass into the gas-meter, and the drum must make a greater number of revolutions, which means that the gas account must be higher. That the pressure of the gas obtained from the Municipal Gas-Works must be lower than it was with the gas supplied in its time by the English concern, follows not only from the foregoing physical explanation, but may be deduced further from the much greater cross sections of the mains of the new distributing system, which, it is well known, are responsible for a diminution in the pressure of the gas. Numerical evidence of the reduction of gas pressure might be very readily afforded if the measurements formerly made (and regularly published in the daily papers) for checking the quality and pressure of the gas were still published at the present time. Unfortunately, this is not the case. These lines might well give rise to such measurements, so eminently desirable in the public interest, being taken by a municipal body, and—for the sake of comparison—being made at the same testing points as formerly, and the results regularly published in the daily papers.

ELECTRIC LIGHTING MEMORANDA.

Marylebone Applies for an Electricity Loan—Possible Consequences of the Application—The Free-Wiring Movement—More Enterprise Needed.

Another step has been taken in respect to the Marylebone electric lighting; the Borough Council having adopted the recommendation of their Electricity Committee to make an application to the London County Council for the capital sum required to carry out the Arbitrators' award. Since the previous meeting, at which the matter was opened up in the light of the Arbitrators' decision, the question of the legal position of the Council had been laid before Mr. Asquith, for his opinion as to what will happen if for any reason, including inability to borrow the money, the award is not carried out. Mr. Asquith fully confirms the opinions already received by the Council from Mr. Moulton and Mr. Cane, to the general effect that there is no prospect of getting the award set aside or varied, seeing that there is no fault to be found with it either in its terms or in substance. So far, Counsel is perfectly clear. He is more reserved, however, in regard to the second part of the question, as to what will happen if the money should not be forthcoming. This is the more important aspect of the situation; and what Counsel says concerning it is no more than that the Council must do their best to comply with the terms of the order. Nobody presumes to prejudge the hypothetical case of what will happen if certain events still in the future occur. The majority of the Council acted like reasonable men; and sent the matter forward for the London County Council to deal with. They can do no more; and they were well advised not to do less.

Nobody can attach any blame to the Marylebone Council for their action in the circumstances; but lively interest attaches to what will happen next. The Metropolitan Electric Supply Company have taken their own course in the affair, and are suing the Council for the money due to them under the award. If payment is wilfully refused, the money may be recovered by the proper legal remedy, just as in the case of any other recalcitrant debtor. But if, notwithstanding all the good will in the world, the Council should be powerless to raise the money necessary to satisfy the order of the Court, a deadlock will arise from which there can be no escape other than that which can be easily surmised. One of the Marylebone councillors remarked at the meeting that, if the London County Council should refuse the loan, all the powers of the borough in this regard will be exhausted, and no authority on earth could then make them go farther. Doubtless, in many individuals, this thought carries its own comfort with it; but the situation so created would be remarkable. It would not, however, be without precedent, in substance if not in form. Nothing is commoner than for Acts of Parliament to be passed authorizing certain undertakings which, for good and sufficient reasons, subsequently prove to be impracticable. The course then taken is to procure an Abandonment Act, with reasonable conditions for the safeguarding of all interests effected. It was not for the lawyers consulted by the Marylebone Council to point this out, as by so doing they might be charged with constructively aiding those who make no secret of their wish to defeat the order of the Court. It is for the Council to do their best to obey the order, and to do it in the proper way, leaving the consequences to declare themselves in due time.

There can be no question but that all suppliers of electric lighting throughout the United Kingdom whose affairs are not prospering as might be desired—which is as much as to say, the majority of those in this business—are very deeply concerned to find a solution of the house-wiring difficulty. Their efforts in this direction are calculated to interest very particularly the suppliers of gas in the same localities. It should, therefore, scarcely be necessary to warn gas companies to keep themselves well informed as to their competitors' methods. But the truth of the matter is that few gas directors and managers of the present generation remember the time when houses were no more generally piped for gas than they are wired for electricity to-day. Yet it is only a few years since Mr. Valon at Ramsgate, and other popularizers of gas, set themselves seriously to deal with the problem presented by old houses which

ought to have been on their books, but were not, mainly by reason of the temporary character of the occupiers' interest in them. Since then, great attention has been laudably directed to the slot-meter method of rendering gas available for the poor householder; while the class immediately above him in the social scale has become interesting to electricians. A strong attempt will be made this year, and again next if necessary, to overcome the objection of the Local Government Board to the wiring loans of local authorities supplying electric light. Many struggling electric lighting companies already wire consumers' houses at a charge of about 4½d. per point per quarter for the simplest class of work, and take all the risk. They are doubtless finding it to their advantage to do so. Originally the electric lighting companies indulged in the antiquated gas companies' tricks of requiring signed agreements, engagements to repay, and all the rest of it, with the result that otherwise willing customers were frightened off. They are wiser now.

There is nothing the ordinary householder dislikes more than putting his hand to paper for something in regard to which he has naturally no knowledge or experience. Taking a supply of electric light or gas is not like purchasing a piece of furniture, or an expensive book, on the instalment system. The electricians have learnt that consumers' agreements are not worth the paper they are written upon, if they go beyond an engagement to pay at a certain price for an article had and consumed. The brewer who sends in a cask of ale does not seek to bind his customer not to patronize any other tradesman, and looks after his empties without any fuss. A certain degree of risk of loss is inseparable from these free-and-easy house-wiring and piping arrangements, but it is better to take it than go without business. The electric lighting companies find themselves absolutely compelled to take this course; and local authorities in the same business will not remain content to lie under a disadvantage in comparison with the companies. When this bugbear of house-wiring is disestablished by a little more general enterprise on the part of the electric lighting interest, the gas companies will feel the competition more keenly than ever. As it is, there are probably ten electricity canvassers to one gas canvasser.

THE WAYS OF MUNICIPAL ELECTRICITY UNDERTAKERS.

The High Court will shortly be called upon to decide a very interesting and important question as to the extent of the powers conferred on a Local Authority by a Provisional Electric Lighting Order, and incidentally as to the construction of the Electric Lighting Acts of 1882 and 1888. A certain West Country Local Authority having established electricity supply works in accordance with the provisions of their Electric Lighting Order, soon discovered that the demand for energy was not so brisk as they were led to believe that it would be by the report of their electric lighting expert. By the way, these reports are always of a rosy character, and raise high expectations in the minds of unsophisticated councillors, who do not realize the true condition of affairs until it is too late.

However, in the present case, the Corporation were anxious to discover some means of stimulating the demand and increasing the number of their consumers, so they decided upon undertaking the wiring and fitting of premises for the electric light. They claim that their Provisional Order, coupled with the Electric Lighting Acts of 1882 and 1888 (and especially clauses 10, 24, and 25 of the 1882 Act), entitle them to do this work. They have, therefore, boldly entered into the field as wiring contractors; thus setting up what most people consider to be very unfair competition with a section of their own ratepayers—viz., the local Gas Company and such electrical engineers, gas-fitters, &c., as may be within their area of supply. Rate-aided competition is so obviously immoral that it is difficult to conceive how any respectable body of councillors could ever be brought to sanction it. It might be added here that the work is often undertaken at cost price, thus precluding all possibility of competition by private traders. One of the worst cases of this character was recently brought to our notice—the case of a great North Country Corporation who undertake wiring work at 7s. 2d. a point, and who have even condescended to tout for petty bell-work, &c. It is surprising that corporations should be allowed to engage in this class of work—work which is plainly *ultra vires*—without even a protest.

Owing to the enterprise and energy of a ratepayer, the West Country Corporation will shortly have to justify their position before a Judge of the Chancery Division. The ratepayer in question thought, so he alleges, that if the Corporation were allowed to proceed with the work of wiring premises, it would lead to increased burdens being placed upon the already overtaxed ratepayers of the district, and that it was also likely to have a very serious and prejudicial effect upon the rights and interests of the local Gas Company, the gas-fitters, electric lighting contractors, &c. Consequently, he commenced an action for an injunction to restrain the Corporation from engaging in wiring work. There is some divergence of legal opinion as to whether a Provisional Electric Lighting Order enables municipal electricity undertakers to fix wires and fittings upon the premises of consumers; but the better, and (in our opinion) the sounder, view, is undoubtedly that, in the absence of special statutory authority in the shape of a Private Act, they cannot do so, and that a Provisional Order confers no such extraordinary powers as the Corporation contend. It is to be sincerely hoped, in the interests of fair and honest trading, that this will be the view that will be taken by the Court. The leading idea running through the whole (as well as of clauses 10, 24, and 25) of the 1882 Act, is that of the supply of electricity. Parliament did not contemplate the idea of a local authority engaging in trading, and competing with their own ratepayers; and, in addition, it is not at all necessary for electricity undertakers, in order to give a proper and efficient supply of electricity, to enter upon consumers' premises, except to fix meters and main fuses. Owing to the loose and somewhat confused wording of some of the clauses of the 1882 Act, and also to the prevailing tendency of local authorities to extend their powers in all directions, a judicial decision on the point in question will be welcome.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 708.)

Last week opened on the Stock Exchange with a very flat tendency pretty well all round; but fortunately it soon began to improve. Thenceforth, to the close, the feeling was fairly good; but there was some irregularity. Consols were marked once on Tuesday at 90⅞, but recovered some of their loss later on. Fresh business was on a very moderate scale; the fortnightly settlement engrossing attention. This was thought to be going smoothly; but two small hammerings were involved. The Money Market was very firm, there being a strong demand for accommodation in connection with the Stock Exchange; and discount rates were steady. Business in the Gas Market was not so heavy as in the previous week; there being somewhat of a reaction from the burst of activity then generated. Changes in quotation were neither numerous nor considerable in degree; and there were just as many one way as the other. A "bear" article against the Gas Companies generally in a financial newspaper last week, written with that cheerful indifference as to facts and figures which presumably satisfies it and its readers (*populus vult decipi*), attracted a little attention. But it was not difficult to see through it; and apparently it missed its mark. In Gaslight and Coke issues, the ordinary failed to maintain the upward movement it was making at the close of the previous week, and began to drop at once. The opening price was only 83½; and from this the figures gradually shrank until the price at the finish had fallen to 82. The quotation showed a reduction of 1. The secured issues also, which had been only just keeping their balance, had to give way—the maximum and the preference losing a point each, while the debenture could only command bottom price. South Metropolitan was only moderately dealt in, there being little demand; and the price slipped down once to 119, with a drop of 1 in the quotation. Very little was done in Commercials; and they did not move. The Suburban and Provincial group was very quiet; but there were some changes on *ex div.* adjustment, mostly favourable, in which Crystal Palace, Hastings, and Lea Bridge were conspicuous gainers. In its local Exchange, Newcastle had a further rise. The price there is about 104; and the figures quoted in London are quite out of harmony with this. Transactions in the Continental Companies were extremely limited, and the prices at which stocks changed hands were not so good as in the previous week; but quotations did not change. Among the undertakings in the remoter world, Hong Kong and San Paulo each had an advance. The Water Companies were almost quieter than ever; and there was no movement except in *ex div.* change.

The daily operations were: Very quiet business on Monday, with an easy tendency. Gaslight ordinary fell 1; but San Paulo rose ½. Tuesday was much the same, and South Metropolitan fell 1. There was no change on Wednesday. On Thursday, with very moderate business, there was a fall of 1 in gaslight maximum and ditto preference; but Hong Kong advanced ½. There was no further change on Friday. Saturday was quiet. Crystal Palace rose 3.

In the "Physical Review," Mr. Sanford A. Moss furnishes proof, from a generalization of Carnot's cycle, that in a gas-engine, where the working substance may be regarded as a perfect gas, the efficiency is the same as for a Carnot engine, with a like range of compression temperatures.

In the course of his third lecture, last Thursday, at the Petroleum Institute, on "Oil as a Fuel," Professor Vivian B. Lewes referred to the various devices for employing mixtures of petroleum spirit and air in place of coal gas and air. He remarked that the danger and many accidents that arose from the use of petroleum spirit led to attempts being made to utilize ordinary paraffins of high flash-point. Referring to incandescent lighting, he pointed out that when this is done by coal gas it is now realized that higher results can be obtained by using air under pressure to draw in the gas to the incandescent mantle burner than by using gas under pressure to draw in air.

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

BY

WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE X., accompanied by Plate No. 12, showing Details of Retort-Settings, Mouthpiece Support, and Cross Stays, with Detail of Regenerative Chambers of the 1000 Tons per Day Inclined-Retort Carbonizing Plant.

If the producers of many of the inclined retort installations erected have been of bad design, the regenerative chambers of the settings have been equally so. Such defects and deficiencies are not new to the gas engineer. We all remember the years of controversy that raged during the period of the supplanting of the direct-fired system by the gaseous-fired system of heating gas-retorts—in fact, I have often thought that if one were merely to substitute the phrase "inclined retorts" for "regenerative furnaces," the controversy of the past, word for word, would almost apply to the present period. Nobody to-day would venture to suggest that the newer system of heating is not an unqualified success; and all are agreed to give credit to those who advocated it in its early history. So it will be with the inclined retort system. The difficulties of the regenerative system of firing have all been overcome, and one might say the system made almost perfect as far as it applies to horizontal settings, a lengthened experience with which has enabled all the earlier weaknesses of construction and defects of form to be sought out, properly understood, and remedied. So it will be with the inclined retort system.

There is no doubt that the construction of the regenerative chambers for a setting of inclined retorts is distinctly different from a similar construction for a horizontal setting; and the former presents many different conditions which have to be met, and difficulties which have to be overcome. The distribution of the producer gas and of the secondary air in angular conduits is more difficult to govern and distribute properly than when these are on the horizontal line. It is common knowledge that many of the earlier inclined retort installations had the materials of which the regenerative chambers were built laid at the angle of the retorts; and, in fact, a great deal more of the brickwork of the setting and benches was built at this angle. However, a little experience (dearly bought in some cases) soon proved that this was absurdly wrong. Thereafter every brick that could possibly be so laid was laid on the horizontal line; so also were the divisions in the regenerative chambers, and the structure forming the same. The common difficulty with the regenerator is to maintain the air-chambers tight in relation to the waste-gas chambers on either or both sides. The chimney "pull," exerting its greatest influence on the lower part of the regenerative chambers, has a tendency to draw air therefrom through the slightest cracks or crevices. A slight excess of producer gas leaving the settings is ignited and consumed at this point, resulting in great heat, and the further destruction and cracking of the lining between the air and the waste-gas chambers, a process which only exaggerates itself and often causes a complete failure of the setting, sometimes in a few weeks. Other installations have worked well for the first period of their use, but have afterwards gone utterly wrong on the second time of lighting up; the disturbance caused by the contraction when letting down and the second expansion of the structure when lighting up, having completely upset the tightness of the structure between the air and waste-gas chambers. In theory, the thinnest possible medium should be employed for dividing the waste gas from the incoming air supply. In practice, this is commonly found to be a $4\frac{1}{2}$-inch brick wall; and while this has no doubt proved to be satisfactory, it is the antithesis of the earlier system which our German friends first introduced to us in those delicately constructed and elaborately designed specimens of pottery-work which were used in the earlier regenerative chambers in connection with retort-settings. The "half-brick" practice cannot be said to be scientific, although its practical utility is unquestioned. I do think, however, that those who have diverged from the $4\frac{1}{2}$-inch brick partition to something of lesser substance, are wiser in their day and generation. One very important factor in connection with the question is often lost sight of; and I think it is a factor which has led to the introduction of the thick partitions in the regenerative chambers. The earlier regenerators introduced from Germany—where the system was first applied by the late Sir William Siemens for the heating of very large volumes of air used in connection with metallurgical and other processes—not only led Siemens himself but many others to believe that the heating of the secondary-air supply for a setting of gas-retorts was one of considerable difficulty, requiring the incoming air to be exposed to a very large surface in order to become heated to the maximum degree possible by contact with substances heated by the waste heat escaping from the setting.

As a matter of fact, the fuel consumption in a gas-works producer is very small when we bear in mind the fact that such a mass of work is maintained at so high a temperature for a period of twenty-four hours. With the Edinburgh settings, carbonizing 18 tons of coal per twenty-four hours, the fuel consumption does not reach 200 lbs. of coke per hour; so that a very small air supply is required. Half of this enters as primary air; the remaining half alone requiring to be heated by the waste gases. A simple and comparatively small area of heated surface is sufficient to fully heat this secondary air to the maximum degree possible.

The introduction of the tiled regenerator, whereby the incoming air is made to traverse backwards and forwards, ascending step by step through channels, on one or either side of which the waste gas descends through channel passages similarly formed, offers a considerable degree of friction to the flow of incoming air, and consequently necessitates an additional pull or suction on the setting. Such a system is, no doubt, responsible for the apparent necessity for thick partition walls, and comparatively large joint beds dividing the gas from the air chambers. When we bear in mind the fact that the best work is obtained from the settings when they are working under a slight back-pressure at the point of combustion, the difficulty of getting the right quantity of air through regenerative chambers offering so much friction to its flow, will be appreciated. As a matter of fact, it can only be the induced current arising from the heating and rarefaction of the incoming air in its passage through the heating chambers that will induce any of it to arrive at the combustion chamber and do the work there required of it. I attribute most of the failures to want of appreciation of this fundamental point. It certainly leads one to say that the easiest possible passage for the air through the heating chambers should be arranged so that the minimum of friction is offered to its passage in a regulated quantity into the combustion hearth of the settings.

The outward thrust from the producer sides is also a common source of danger to the regenerative chambers; and unless these are so constructed as to afford an ample stay, and transmit the pressure exerted by the producer sides through the chambers to the division walls of the setting without disturbing the regenerative chambers themselves, trouble must inevitably arise sooner or later. The whole object of the construction of the regenerative chamber should be to afford the easiest possible passage for the air in contact with the heating medium, to the point where it is required, undiverted by any obstruction or structural disturbance either owing to expansion or contraction, or even to actual defects in construction. That is to say, its easiest course should be the way in which we wish it to travel, in preference to its being drawn through cracks and crevices into the waste-gas chambers. A simple upward open channel appears to afford the best chamber in this respect; for, although the chimney "pull" is on either side of it, the easiest direction for the air to travel is the way in which we wish it to go—even ordinary cracks offering more resistance to the flow of the air into the waste-gas chambers than its direct access to the setting. The tube regenerator has, therefore, come into pretty general service; special pipes, and ordinary fire-clay drain pipes, being used for this purpose.

The formation of the regenerative chambers of the Edinburgh settings is shown upon Plate No. 11, figs. 2, 3, 5, 6, and 7, and in perspective upon Plate No. 12, fig. 1. Figs. 2, 3, and 4 show a detail of each regenerator block. Fig. 5 shows the means adopted for forming the collecting chambers at the top of the vertical channels in the regenerator. Fig. 6 shows the special form of bridge-block to protect the air-chambers at the point where the waste gases enter the regenerator and are divided so as to descend on either side of the regenerator blocks.

The secondary-air chambers consist of a number of specially formed fire-clay blocks; each block being of the form shown in detail. Plate No. 12, figs. 2, 3, and 4, arranged and built up in the form of a chamber, as shown in perspective, and in Photographs Nos. 45 and 46. The thickness of the partition between the waste-gas chambers and the air-chamber is $1\frac{1}{4}$ inches. The length of the joint through which the air would have to travel to get into the waste-gas chambers is $2\frac{1}{4}$ inches, in addition to which the upper flange of the socket of the block is bonded with a fillet of fire-clay—practically doubling this amount. The blocks are 18 inches long and 10 inches deep over the sockets. To stiffen the air-chamber, partitions 1 inch thick are provided, placed transversely across the breadth of the same—three in number to each block; the two outer ends being enclosed with a partition of lesser thickness so as to enable the blocks to be laid one upon the other and to break joint. These transverse partitions, therefore, divide it into a perforated block having four holes, 6 inches long by $3\frac{3}{8}$ inches wide, and the full depth of the block. The ends are butt-jointed, the tightness of this joint being immaterial, as it only permits of a communication between the waste-gas chambers

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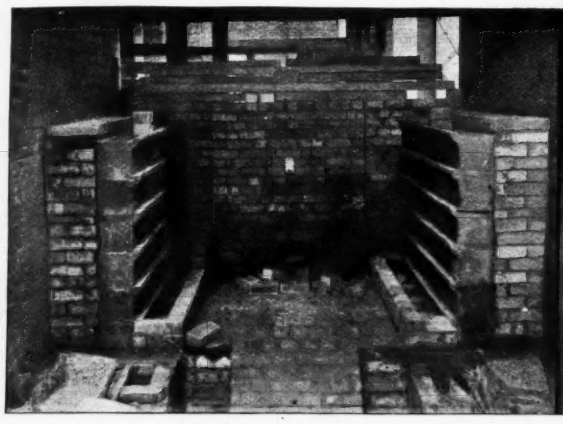
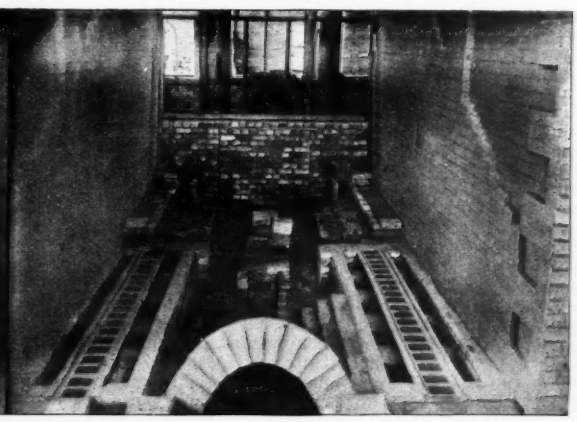
on either side of the secondary-air chambers. In order to steady the chamber when built up with a number of these blocks, and also to resist the side-thrust from the producer, ordinary fire-brick struts (seen in Photographs Nos. 45 and 46) resting upon the projecting lip or socket of the perforated block—one opposite each joint—are placed; the other ends resting in the brickwork forming the sides of the producer, and on the opposite side, extending directly from the side of the air-chambers to the side of the division walls of the retort-settings. By this means, all side-thrust is resisted and transmitted direct to the side walls of the settings. The exact positions of these stay-bricks can be seen by reference to the general drawing of the settings, Plate No. 11. These bricks, arranged as they are in the waste-gas chambers, to a certain extent act as baffles, and by means of their contact with the sides of the air-heating chambers, doubtless transmit a certain amount of heat by their direct contact to the interior of the same. The waste gases leave the setting and descend directly downwards, while the incoming air ascends through the vertical channels formed in the regenerator blocks. In order to ensure a satisfactory distribution of the secondary air through the interior of this chamber, a channel is formed at the base, immediately in line with the secondary-air port covered with a tile, through which apertures are made graded in size. The largest size is the farthest from the air inlet, and the smallest size near the outside of the setting—as exhibited on Plate No. 11, figs. 5 and 9, and Photograph No. 47. It may perhaps be added that the regenerator blocks were all stamped out by machinery; and there was not a wastage of 2 per cent. over the entire job.

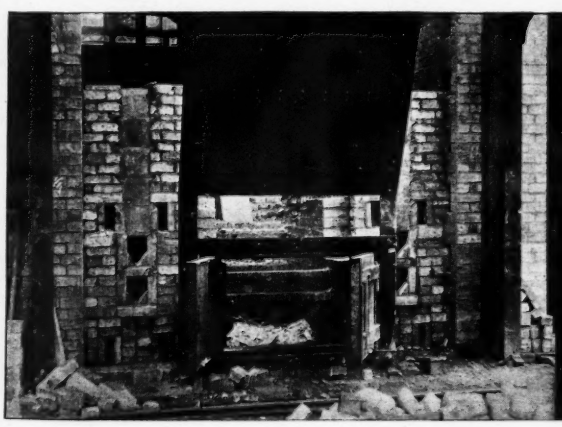
One of the theories with regard to the design of this block was that it should enable a structure to be built to serve the purpose intended, and be of such a character that any undue strain or settlement would fracture a part that was of no material importance to the structure as a whole. The transverse partitions converting the block into a series of channels or pipes were, therefore, made to be the weakest part—any fracture in these merely permitting air to escape from chamber to chamber. It has been found from experience that this theory has been borne out by practice. In the making, and also in the laying and jointing of the blocks, fractures have sometimes occurred; but they have invariably done so in the transverse partitions, and in no instance was the outer casing of the blocks injured by fire cracks.



PHOTOGRAPH No. 45.—Illustrating the construction of the secondary-air chambers of the regenerator with waste-gas chambers on either side.



PHOTOGRAPH No. 46.—Illustrating the regenerator chambers, in plan with the brick struts on either side.



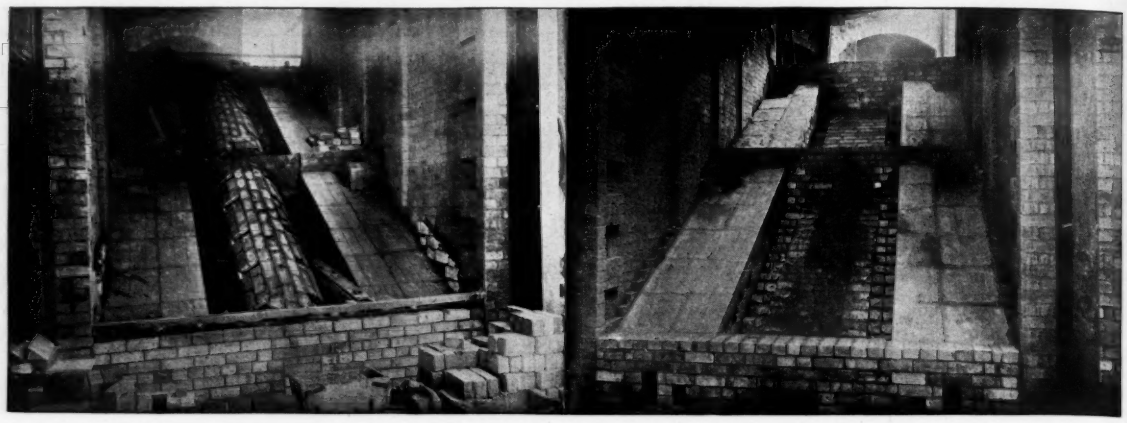
PHOTOGRAPH No. 47.—Illustrating the formation of the air and damper channels, and the means of distributing the secondary air uniformly through the recuperators.

PHOTOGRAPH No. 48.—Illustrating the construction of the producer-gas conduit on the upper and lower halves, with the regenerator chambers tiled down on either side, and on the upper half at the front of the settings; the waste-gas port on the lower half being in the middle of the setting.

As these have now been in use at the New Street works for the past five years, and a 12 lb. to 14 lb. fuel account is still the monthly average, there is every reason to assume that they are remaining perfectly good in actual and extended operation.

The detailed general arrangements of the retort-settings and regenerators are exhibited upon Plate No. 11, where many sectional views are shown embracing different parts of the construction as a whole. Each setting consists of nine retorts [See Photograph No. 56], 20 feet long, of the special cross section shown in fig. 16, with outwardly sloping sides for a height of 6 or 7 inches, so as to permit of the free expansion of the charge without jamming beneath the crown of the retort. The retorts are arranged three in line and three tiers high, one immediately over the other. The clear space in the gas-way of the settings between the division walls is 10 ft. 5 in. The retorts are 22½ inches broad at their greatest width by 15¼ inches deep, inside.

No combustion chamber, in the ordinary sense of the term, has been provided in these settings; the combustion taking place along the entire length and between the centre and outer row of retorts on either side. [See Photograph No. 53.] For this purpose, the retorts are spaced wider apart at their centre; hence the necessity for division walls 12 feet centre to centre. When working with high heats, I have always found that the introduction of cavities bridged over by arches or blocks in a retort-setting is a fatal weakness to the structure. There is no material that will withstand the intense heat in the immediate vicinity of the combustion of the producer gases. To bring this about in an ordinary chamber, either bridged over with tiles or arches, subjects the material to such a tremendous heat that even silica itself, in the form of arches or blocks, or in any form that can possibly give way, succumbs to the attack. In fact, silica is not a suitable material to be subjected to structural stress. Its tensile and compressive strength is no greater than that of chalk. It should, therefore, only be used where it is solidly packed by substances of a stronger nature. I have consequently always preferred to make the setting as solid as possible; and there is more economy secured by inserting a retort where the majority of people put in a combustion chamber,



PHOTOGRAPH No. 49.—Showing the producer-gas conduit with the outlet ports.

PHOTOGRAPH No. 50.—The top of the producer-gas conduit prepared for receiving the silica tiles; the secondary-air ports being seen on the left-hand side. The gas ports are temporarily covered in the step-portion with bricks laid in dry.

If a combustion chamber is to be introduced, it must be one of huge capacity; the shape adopted in the old "Imperial" settings (which practically occupied the space of three retorts) being the only satisfactory one. Since, however, combustion chambers have been proved to be unnecessary, provided there is a proper distribution of gas, and the retorts are protected from actual flame contact, I prefer to fill this space with retorts to wasting it upon a construction which is inherently weak.

The producer gas is, by means of two conduits, conducted into two channels [See Photographs Nos. 48 and 49] communicating respectively with the upper and lower halves of the setting. Each of these conduits is governed by valves or dampers, to regulate the proportion of gas to each half of the setting. The chamber from which the gas is distributed is under the centre middle retort, and is 1 foot deep by 1 foot wide, divided at the middle and covered by a 9-inch brick semi-circular arch of specially formed bricks through which suitable ports are made [See Photograph No. 49] for communicating by means of channels with the hearth of the setting. The spandrils of this arch are levelled up with brickwork [See Photograph No. 50], and immediately above the crown of the arch a silica tile, 9 inches thick by 2 ft. 3 in. wide, is laid from top to bottom of the setting. Upon this the centre bottom middle retort rests. [See Photograph No. 51.] The gas and air ports are, by means of channels communicating with their respective chambers, brought to the hearth of the setting which is situated between the retorts, the level of which is 6 inches above the bottom of the bottom row of retorts. [See Photograph No. 52.]

Longitudinally in the hearth, the gas and air ports are arranged alternately; the air-ports discharging immediately beneath the brickwork of the division walls, and the gas-ports in between the division walls. The object of this is to divert the flame from impact beneath the division walls at this particular point. [See Photographs Nos. 53 and 54]; the flame ascending between the same. The sides and bottoms of the retorts of the first two tiers are shielded with silica tiles so as to prevent actual flame-contact.

It is better to arrange the ports communicating from the gas

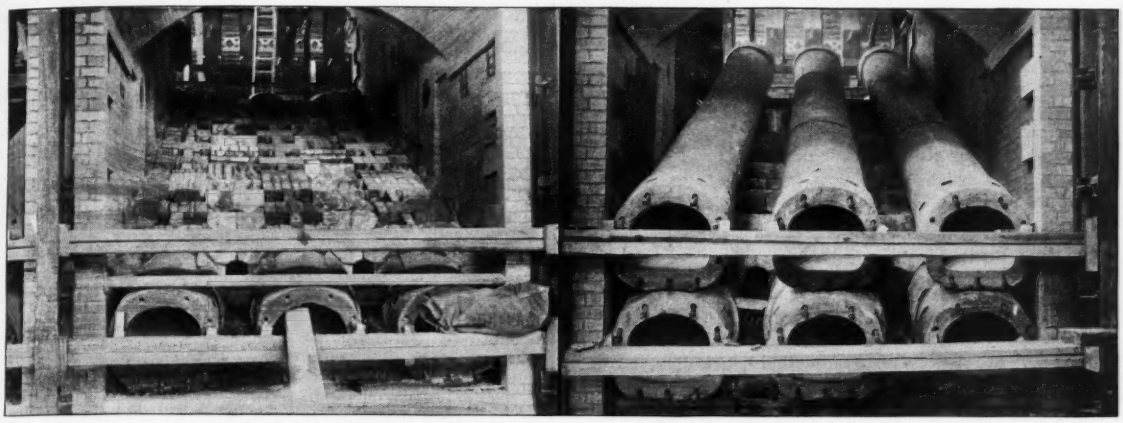
PHOTOGRAPH No. 51.—Silica tiling above the producer-gas conduit, forming the base for the centre bottom retort, together with the seating for the two outside bottom retorts and the gas channels beneath them. The gas and air ports are alternately on either side in the step-portion of the work; the sloping hearth of the setting being 6 inches above the silica tiles.

PHOTOGRAPH No. 52.—The producer hearth just prior to it being brought to a uniform slope, with the gas and air ports alternately.

and air chambers to the hearth of the combustion chamber of ample size in the first instance, and afterwards to proportion their respective sizes, on first heating up, by placing a split brick over the aperture with a little fire-clay mixed with lime water which soon causes the clay to flux and the brick to adhere, reducing the aperture to the desired area.

It is difficult to explain the construction of a retort-setting even with the aid of many drawings. The photographs will, however, assist very materially in clearing up points which are not otherwise referred to. The secondary air is conducted through angular conduits covered by a double layer of 3-inch tiles, communicating with the chamber above the regenerators running on either side. From these the ports communicate to the setting. [See Photograph No. 50.] In all cases, the inlets to the angular distributing chambers, whether they are gas-conduits or conduits for air, are arranged to feed from the lower end.

The circulation of the heat in the settings is of the simplest order. Ascending on either side of the centre row of retorts [See Photographs Nos. 54, 55, and 56], it passes over the two outer upper retorts, descending on their opposite sides, where they are at the same time drawn to the fronts on the lower side. Thereafter it passes up a three-way channel beneath the outside bottom retort, and descends to the regenerative chambers beneath. The areas of the flue-ways in the settings are proportioned so as to be as nearly alike as possible after the gas once leaves the centre or combustion chamber. To accomplish this, it has been necessary to tile the setting entirely over the top retorts throughout the length and beneath the arch, so that there is an even pull and flow of gas throughout. In practice, I have found these tiles useable over and over again. The first cost is, therefore, the only outlay; and there is little labour involved in putting them into position. This forms a complete non-conducting chamber between the upper part of the setting and the cavity beneath the arch. It also enables the upper and lower halves of the settings to be distinctly and absolutety subdivided into two chambers—the four dampers, thus, each actuating only one-quarter of the complete setting. At all points where actual flame-contact occurs, silica bricks or blocks are used, as will be seen from the photographs. At all other points in direct contact with live heat as well as the retorts themselves, Glenboig materials were

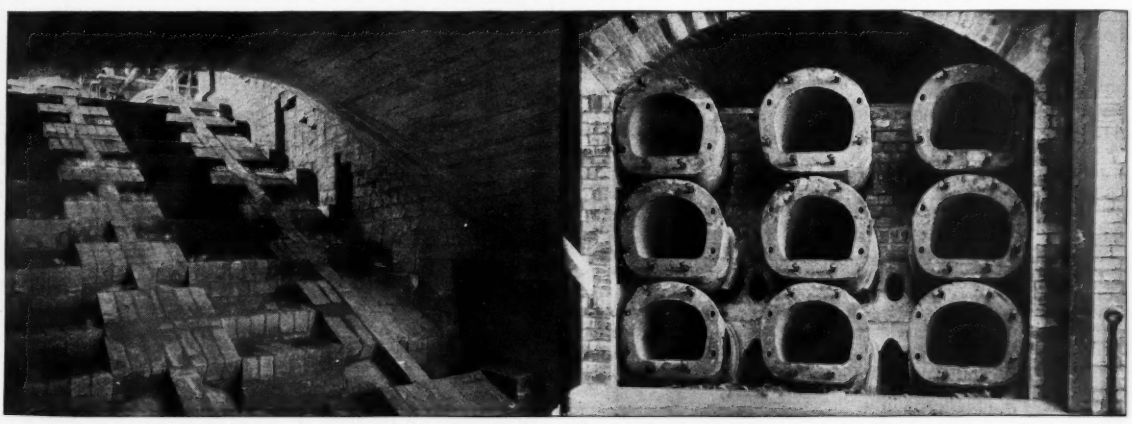


PHOTOGRAPH No. 53.—The seat of combustion between the retorts, constructed of silica blocks and shields protecting the retorts.

PHOTOGRAPH No. 54.—The combustion chambers with the second row of retorts in position, shielded with silica tiles. Above this level, Glenboig bricks were used for the remainder of the setting.

employed. The benches and arches and general work are constructed of the Morningside Company's bricks; the same bricks being also used in the filling in of all cavities at the back of the producer and other places; no holes being left (such as one often sees left in settings of this class), in which gas could accumulate, with consequent risk of explosions. I have always considered such cavities false economy. The bricks once purchased are everlasting in these positions, and can always be used over and over again. In my opinion, there is nothing like solid work in a retort-setting. The stability thus afforded more than repays for the original outlay.

When the two settings of which the Granton installation forms many multiples, were erected at the New Street works, they were on almost identical lines. One setting, however, was constructed with ordinary brick division walls; the other with specially formed blocks. These two settings have now carbonized over 24,150 tons of coal, and both are as good now as when started. It is, therefore, too early to determine whether the system of setting with blocks or with bricks is the better of the two. At Granton, however, we used blocks to a point a little below the level of the crown of the middle row of retorts, and thereafter ordinary bricks. The retorts are shown in detail upon Plates Nos. 11 and 12, figs. 15 and 16, and 7 and 8 respectively. This drawing also shows the position of the division walls and the joints in the retorts, fig. 17. The retorts are each in three pieces; the middle length being 7 ft. $4\frac{3}{4}$ in. long, with the joint at right angles to the line of the base of the retort. I have had experience with all forms of joints in inclined retorts; and I am quite satisfied that this form is the best. It enables the retort to be made and burned uniformly. Having one square end to rest upon, the retorts appear to keep straighter while in the kiln, and the joints are perfectly covered and protected by the introduction of two 18-inch division walls, which in themselves are no detriment to the setting. The front and back walls of the settings are 14-inch work, and there are in addition seven 9-inch division walls. The gas or heat spaces, therefore, in the setting vary from 7 to $8\frac{1}{2}$ inches. A mass of brickwork it certainly looks on a drawing; but the stability of a setting of this character is very great. The reserve of heat which such a mass of brickwork contains is also



PHOTOGRAPH No. 55.—The base prepared for the top row of retorts; the retort joints being beneath the two 18-inch walls seen hereon. This photograph also illustrates the extent to which horizontal work was maintained throughout the setting.

PHOTOGRAPH No. 56.—The upper half of a complete setting, with the front wall removed, illustrating the combustion chambers and shield tiles in position.

of considerable advantage in equalizing temperatures; and this is not unimportant when working four-hour charges. The fronts and backs of the settings surrounding the mouthpieces are protected with a $1\frac{1}{4}$-inch facing of non-conducting composition. The object of this was, in the first instance (in the New Street settings), to protect the men from the intense heat, owing to cramped conditions; and it was extended to the Granton settings in consequence of it having the effect of drawing the heat to the mouthpiece ends of the retorts. Whether it would be better to employ this as an insertion between (say) a 9-inch inside wall and a $4\frac{1}{2}$-inch outside wall, is a matter for some future experiment. Under any circumstances, however, the material is removable; and with the addition of a little new stuff, it can be reused over and over again. The entire cost at Granton for serving the 56 settings back and front was for material and labour £118 17s. 4d. This, on the face of it, appears a large sum; but as it only represents a charge on the first year's make of 0·0178d. per 1000 cubic feet of gas manufactured, it is not after all a serious item compared with the advantages which, although not easily calculated, are, in my opinion, considerably in excess of its cost.

The whole of the brickwork in the benches and the retort-settings was set with a mixture of finely-ground fire-clay brick-dust and finely ground clay—66 per cent. of dust to 33 per cent. of clay. With such a mixture, practically no shrinkage of joints in the work occurs. The bricks are, so to speak, set and resting upon granular particles of already burnt clay; the new clay merely acting as a matrix to the whole.

The work throughout was specified to be hammer-set, and care was taken during construction to have sufficient supervision to ensure this being carried out, although some little trouble was experienced in persuading the men that it was better to hammer a fire-clay brick hard home than to neatly set it in position on a deep bed. To ensure sound work in a retort-setting, one must at times sacrifice appearances—particularly in the body of the work—for the sake of solidity and efficiency. One cannot have hammer-work and keep every line and every joint as true as with trowel-set work. But as solidity is of supreme importance, appearances in the interior work should be carefully established as secondary. With bricks of uniform size, very good work can, however, be done; and the photographs illustrating the work in various stages of progress will show that this was the case.

DIBDIN AND COOKE ON PHOTOMETRY AND ELECTRIC LIGHTING.

It is only the other day that we had to review a heavy book by Mr. Dibdin, which dealt at length with photometry and electric lighting; and now our attention is again called to a bulky volume edited by him, in which, while he is personally responsible for the photometry, Mr. Cooke, the head of the Electrical Engineering and Physics Department of the Battersea Polytechnic, answers for the electrical matter.* It is impossible to rejoice in this multiplicity of text-books, especially when they are offered on the same personal authority. Some regard must be had to the limited purchasing power of most students, whether of electric lighting or photometry; and it is conspicuously true that, so far as they are concerned, a great book is a great evil. If we had the advising of any student of an engineering subject, in regard to the text-books that he ought to procure, it would be our first thought to run over the titles of the newest and fullest works that had come under notice. For it is the experience of everyone who has gone through the mill that, while the scanty resources of the poor student—and all students are poor—incline him to haunt the second-hand book-stalls, in the hope of picking up a useful book or two for a trifle, this is usually a first-rate way of wasting time and money. Unless a man knows thoroughly well what is good in the shape of a book, and also what it is worth—which is almost too much knowledge to expect of a student—he had better, as a rule, husband his resources for the acquisition of technical literature until he can supply himself with a well-recommended modern work. It used to be a safe guide in this respect to follow the taste of one's superior; and it is so still, where the authority in question is not himself an author. But when the professor has written a book, what is the student to do? A difficult and a delicate question, which it behoves professional teachers who may at any time be tempted into book-making to ponder very carefully.

Generally speaking, the temptation to a professor of a branch of science to reduce the ordinary matter of his "course" to writing, for publication, is irresistible. If the result is kept within the bounds of reason and the real requirements of the case, this is a good thing. It has the effect of holding the teacher and his pupils in touch when they are not together; and the master can always, and very acceptably, by word of mouth embroider and fill in the bare lines of the text to his heart's content, and in accordance with the needs of the time. When a professor compiles a big book, however, priced to suit, the question of its justification immediately suggests itself; and the onus of proof lies upon the author. It is not always sustained. Too often the expensive book is found to be made up with a good deal of padding, such as would serve equally well for making bulk in other books upon similar matters.

Mr. Cooke's treatment of his part in this volume of "Groves and Thorp," is consistently good. He gives the reader credit for knowing the elementary theory of electricity and magnetism; and therefore he does not go over everything ostensibly for his benefit—really, for making a certain quantity of printed matter. He is not particularly easy to read, which is rather a compliment. Where this difficulty is attributable to the smallness of the print, however, it is a defect for which the publishers are to blame. A text-book should not be printed with too large type, or in too open a form, because it is not meant to be scanned, like the "Monthly Review," in railway carriages; and excessively large print tends to destroy the point of a demonstration. But when it comes to illegibility of the figures of a formula without the aid of a magnifying glass—as in our copy—conciseness seems to be bought too dearly. A watchmaker's magnifier is needed to read the figures on page 10 of the book, which is an absurdity.

Mr. Cooke's way of dealing with the problems of electricity distribution is altogether excellent. He begins with this aspect of the subject, and does not leave it until he has exhausted it. His discussion of the various systems of electric main laying leaves nothing to be desired, either in respect of learning or actuality. In discoursing upon electric lamps and their use, in connection with the distributed current, Mr. Cooke is particularly lucid on the point of voltage. He explains how and why a low potential is economical for incandescent lighting, and the grounds upon which the upper limit in this regard has been touched by the supply companies. On the whole, we are satisfied that those who desire really sound, solid, information on the subjects of which he treats—and they are numerous—cannot do better than read Mr. Cooke. Whether it was necessary to go quite so deeply as he does into dynamo design and such matters may be arguable; but he does it, and there is absolutely no padding. The information respecting incandescent electric lamps is also distinctly good, and includes some hints on the use of Nernst lamps. Elsewhere, the author remarks that for small private electric lighting installations a gas-engine and dynamo, with a storage battery, are the most satisfactory arrangement.

The subject of "Photometry" occupies a secondary place in this book—less than 100 pages, as compared with the 277 pages devoted to electric lighting. It is not necessary to criticize Mr. Dibdin's work at length, as it is very much the same as that previously extant. The descriptive catalogue of photometers, however, is very full; and so is the part relating to standards of light. It was obviously desirable that this series of volumes should contain all necessary information on a topic so germane to the scheme of the subject-matter as photometry; and Mr. Dibdin has done what was required in a thoroughly satisfactory manner.

In concluding this notice, it is pleasing to be able to record the opinion that the present volume is equal in value and interest to any of its precursors in the useful series to which it belongs.

* "Groves and Thorp's Chemical Technology, or Chemistry in its Applications to Arts and Manufactures." Vol. IV. Electric Lighting and Photometry. By A. G. Cooke and W. J. Dibdin. London: J. & A. Churchill; 1903.

PERSONAL.

The management of the Magherafelt Gas-Works will henceforward be in the hands of Mr. Dickson, of Ballycastle, who has succeeded Mr. H. Fitzsimmons.

Mr. R. Lockey, who has been for four years with the Rushden and Higham Ferrers Gas Company, has obtained the appointment of Manager of the Raunds Gas Company.

Mr. Ernest J. Wellens, Assistant to Mr. E. E. J. Anderson at the Middleton Gas-Works, has been appointed Gas Manager to the Hebden Bridge and Mytholmroyd Gas Board.

At a recent sitting of the Basingstoke Urban District Council, the resignation was received of Mr. George Fitton, who for the past seven years has filled the offices of Borough Surveyor, Inspector of Nuisances, and Water-Works Manager. A resolution was passed expressing high appreciation of his services, and wishing him success and prosperity in the new position he has obtained.

Mr. C. B. Tully, Manager and Secretary of the Sligo Gas Company, is about to relinquish this appointment, which he has held for fifteen years, in order to enter the service of a London firm of contractors for gas-works machinery. Mr. Tully's father was for some time Distributing Engineer to the London Gas Company—the last undertaking to be absorbed by The Gaslight and Coke Company.

It has already been announced in the "Journal" that Dr. Harold G. Colman, one of the Chemists in the Gas Department of the Birmingham Corporation, and Examiner in "Gas Manufacture" at the City and Guilds of London Institute, was about to relinquish the former position, to which he was appointed in 1892, in order to commence practice on his own account as a consultant in London. Dr. Colman attended the meeting of the Gas Committee for the last time on Monday, the 9th inst.

OBITUARY.

The death took place on Sunday, the 8th inst., at his residence at Hayward's Heath, of Mr. F. W. Dobson, Manager and Superintendent of the water-works of the Cuckfield Rural District Council. Deceased had for some time been in ill-health, and unable to discharge his duties; but he was so highly valued by the Council that he was retained in their service practically till his death.

On Monday last week, Halifax lost one of its most prominent and honoured townsmen by the death of Mr. James Bairstow, two days after completing his 82nd year. He had resided in Halifax for more than 70 years; and for 20 of them he was a conspicuous figure in municipal life. He used to say that he had sat under 15 Mayors, exclusive of himself, and had been associated with 36 Aldermen, 132 Councillors, and four Town Clerks. As a member of the Corporation, he took great interest in the work of securing for the town the watersheds it now possesses, and in the construction of reservoirs. He was a high authority on every detail in connection with the Water Department, was well versed in the Acts of Parliament relating thereto, and was often consulted by outside authorities on gas and water—his favourite subjects. He held that each department should pay for itself, and that one should not contribute part of its profits to others which were being conducted at a loss. Consequently, when, during the years in which the extensions of the water-works were being carried out, large sums were every year taken from the gas profits in aid of the rates, this policy met with strenuous opposition from him. Deceased leaves two sons, one of whom is a barrister of Leeds.

A paper was recently read before the Royal Dublin Society by Dr. G. Johnstone Stoney, F.R.S., describing a simple method of co-relating British and decimal weights and measures. The paper furnishes particulars in regard to a proposal for legislation which the author submitted two years ago to the Board of Trade; its aim being to get rid of the irrationality between the two methods of measurement. The main parts of the proposal are that an Act should be passed making the yard exactly 0·9 of a metre, the avoirdupois pound exactly 0·9 of the metric pound or half kilogramme, and the imperial gallon exactly 0·9 of the metric gallon or half decalitre. They at present differ from these amounts by small but very troublesome fractions.

COMMUNICATED ARTICLES.

BLUE WATER GAS AT ILFORD—AND ELSEWHERE.

II.

By A. G. Glasgow, M.Inst.C.E.

I presume that all of the replies which will be made to my statement of Feb. 10 have now been published. I will deal with them *seriatim*.

I. Mr. Brown says, in his letter of Feb. 14: "The figures I gave as to the cost of manufacturing blue water gas are certainly incomplete; but surely the omissions could be supplied by any person of average intelligence." He thus quaintly relies upon the exercise of average intelligence by others—not by himself. I admit his contention; but in this selfish world it is customary to provide the intelligence—average or otherwise—governing our own actions, and to limit our actions accordingly. Mr. Brown's pendulum of cost now swings rather to the other extreme. As I am trying to indicate the true facts of the case, I am as much opposed to an over-statement as to an under-statement of the cost of blue water gas. Therefore, I will briefly review his last estimates.

Our principal differences will be found in the charge for wear and tear, and in management, office, yard, and incidental expenses. Following the definition of wear and tear given in my statement, I estimate that the average expense on this account is well under 2d. per 1000 cubic feet, against Mr. Brown's estimate of 4d. On the other hand, I cannot entertain his curious suggestion that management, office, yard, and incidental expenses, in connection with the manufacture of blue water gas, constitute a *minus* quantity per 1000 feet of such gas manufactured; nor, in view of his further deduction of 0·3d. per 1000 feet, is there warrant for an aggregate charge of less than 1d. on these accounts.

These two corrections substituted into Mr. Brown's table reduce his total from 8·7d. to say 7½d. per 1000 cubic feet of blue water gas; and there appears to be little doubt that this very nearly represents the true facts at Ilford. This figure is 115 per cent. more than the "cost of blue water gas per 1000 cubic feet—3·48d." given in Mr. Brown's testimonial letter, which "cost" has been widely advertised by the builders of his plant. In the light of these figures, Mr. Brown's explanation might be fairly paraphrazed to read: I gave the "cost of blue water gas per 1000 cubic feet—3·48d.," but no "person of average intelligence" would believe it. Hence, why "such a clamour?"

But Mr. Brown has faced his predicament squarely; and, in my turn, I will endeavour to answer his final proposition. He states that "*the net cost of coal gas* at Ilford is not less than 2s. 2d. per 1000 cubic feet," and asks what I estimate "carburetted water gas would cost under similar circumstances." I accept his figure with astonishment, and reply that the inclusive holder-cost of carburetted water gas of the quality of his town gas should be, approximately, one-half the cost of his coal gas, and less than double the cost of his blue water gas. Manifestly, then, commercial considerations require the complete substitution of carburetted water gas for coal gas at Ilford; and, even when these purely commercial considerations are modified by the general expediency of maintaining the dual systems of manufacture, it would seem that the interest of both shareholders and consumers demands that the whole of the coke produced should be used in the manufacture of carburetted water gas. Compared with the stated cost of the ordinary coal gas, this should mean a saving of over 8d. per 1000 cubic feet of total output, while maintaining the full calorific and illuminating standards. In other words, this would be a genuine, not a fictitious saving; for the dual standards of quality would be preserved.

As far as admixture of blue water gas is concerned, this gas has one-half the heating power of the ordinary coal gas, or of the proposed carburetted water gas, gives no luminosity whatever in ordinary flat-flame burners, and will not develop with ordinary Welsbach burners (adjusted) one-half the incandescent effect of an equal volume of carburetted water gas. It is conservative, then, to say that this blue water gas is worth to consumers but one-half the value of the proposed carburetted water gas.

Taking the selling price of Ilford undiluted gas at 3s. 6d., the blue gas delivered to the consumer would be worth to him 1s. 9d. per 1000 cubic feet. The saving in its cost of manufacture at Ilford would be less than 7d.; showing a net loss by its use, to the consumer, or (in time) to the shareholder, or to both jointly, of 1s. 2d. per 1000 cubic feet of blue water gas distributed.

No matter how the Ilford gases are mixed and juggled, this ultimate loss must still be faced somewhere, as between the use of carburetted water gas and blue water gas. The effort to reduce the discrepancy in the values of these two gases by opportune super-saturation with benzol vapours, and by the manufacture of oil-gas in retorts, is to that extent begging the question of blue gas admixture, by linking a discredited with an obsolete method of enrichment.

I quite recognize that, at the present time, there is no parliamentary restriction upon the calorific power of gas, and that no legal penalties follow a defection in this respect. I also recognise that it is often possible—by concentrating benzol enrichment to the time and district of official testing—to reduce the quantity used to an apparently economical limit, when distributed over the entire bulk of the gas, and yet escape penalties for deficiency of illuminating power. I still further recognize that instead of a defection in quality (either calorific or illuminating) being promptly visited upon the suppliers, it will primarily result in an increased demand for gas. This is due to the momentum (or "goodwill") of an industry which has long been a monopoly, and still retains monopolistic superstitions.

Nevertheless, all will agree that the gas industry is established not for to-day, but for to-morrow; and few will deny that this "to-morrow" will see, not the slothful conditions of monopoly, but an active struggle for existence under the general laws governing industry and commerce. The fundamental requirement of success in these directions is to give the greatest value for the least money, and the consumer is the judge. The manager who tries to serve his proprietors by tricking his customers is an opportunist of the worst character; for, although "you may fool some people all the time, and all people sometimes, you cannot fool all people all the time;" and after people awake from their folly—the deluge.

II. Mr. Dellwik intimated in the "Journal" of Feb. 17 that his reply (if any) to my statement would be the outcome of his "detailed attention;" and, in his communication of Feb. 24, we have the fruition of his labours. He fancies, or pretends to fancy, that he has produced a smart defence. Others may perceive that he has missed the one course possible in the premises —*l'amende honorable*, in which case his hypocrisy with Mr. Humphreys might have been overlooked.

Mr. Dellwik follows the stereotyped method of defendants with no defence. He completely ignores the issue; claims a *tu quoque;* introduces new and irrelevant matter; and elaborates contentions which I am interested neither to affirm nor deny.

I have charged Mr. Dellwik and his associates, in the most circumstantial way, with uttering fictitious figures as to the cost of blue water gas at Ilford, and with deducing fictitious fuel results from the Lowe process for comparison with tests of the Dellwik generator. In view of the evidence I submitted, my indictment amounted to conviction; but, if confirmation were needed, it is found in Mr. Brown's letter.

Nevertheless, throughout the length of his reply Mr. Dellwik mentions neither the Ilford results, nor Mr. Brown's letter, nor his method of deducing fictitious fuel results from the Lowe process. His reply is like Hamlet without the melancholy Prince. His only approach to a defence is that my "interpretation presupposes a gullibility in the average engineer which is anything but flattering to the profession;" and this he applies merely to his use of the term "carburetted water gas," on which I offered no comment. If he wishes my view of this question, I have no objection to stating that this term is applicable at Cleethorpes; but its use, under the conditions at Ilford, strikes me as a barefaced attempt to misappropriate the goodwill of the "generally accepted term" for a gas which now represents more than one-third of all town gas used by the English-speaking race. But all this is beside the mark; for the statement that my "attitude seems based on the assumption that the term 'carburetted water gas' should be interpreted in the narrow sense," is a red herring of the rankest odour.

Mr. Dellwik is convicted of using a fictitious cost for blue water gas at Ilford. In return, he quotes figures for illuminating gas from unknown towns, only one of which is specified to be "water gas benzolized." It happens that the cost of this gas is also specified to be "estimated." If it were estimated with Mr. Dellwik's assistance, without the censorship of "average intelligence" or non-"gullibility," I cannot see its bearing upon the case. Moreover, as this estimated cost, after being edited by Mr. Dellwik, is still 10·41d. per 1000 cubic feet, with coke at 9s. 3d. per ton, it scarcely proves the Dellwik legend, "Why grumble at the price of coal when you can make *carburetted water-gas* [I use italics for want of the original 'display' type] at less than 6d. per 1000 cubic feet from coke costing 16s. 8d. per ton"—pointing to Ilford in confirmation.

Mr. Dellwik then begs the whole question, by deducing from the above estimate of benzolized gas the conclusion that [my italics] *the cost of fuel, generating wages, and water* is 3·59d. per 1000 cubic feet. With coke at 9s. 3d. per ton, nobody objects to this estimate of the three items named; in fact, the cost we have arrived at for Ilford is based upon 3·95d. for these items, with coke at 16s. 8d. per ton.

We have further irrelevant deductions, regarding Manchester carburetted water gas. Mr. Dellwik estimates that the cost of raw materials for the year ended March 31, 1902, was 11·45d. per 1000 cubic feet of carburetted water gas of 18·54-candle power. But non-"gullibility" is needed at this point; for he is using the candle power of the town supply. The carburetted water gas averaged, for the year under review, 25·48-candle power. If we finish Mr. Dellwik's deductions, by adding the remaining items given in his unedited example of benzolized water gas, we get a total holder-cost for the year of 13·98d. per 1000 cubic feet for carburetted water gas of 25·5-candle power. This is the result of Mr. Dellwik's figuring, for which I assume no responsibility

and why he has introduced it is a mystery to me. It might serve as a basis for a testimonial to Manchester working, but not for his obscure inference that "the wide discrepancy between such results (*i.e.*, carefully-conducted tests) and those apparently usual on regular working may be largely due to what Mr. Glasgow calls the 'complex thermal side of the Lowe process.'"

This suggestion of discrepancy recalls the two accounts now published of the Dellwik generator at Plauen. The first certifies that the Dellwik representative "has this day made the contracted tests of yield. These tests showed an average yield of 2·6 cubic metres per kilogramme of carbon contained in the coke." This is the equivalent to 24 lbs. of "carbon" per 1000 cubic feet. But the year's working at Plauen with the Dellwik-Fleischer generator, detailed with the utmost minuteness in the "Journal für Gasbeleuchtung" for Dec. 13, and translated in the "Gas World" for Jan. 24 last, gave a consumption of coke in the generator of 50 lbs. per 1000 cubic feet. When the boiler-fuel is included (as at Manchester), the director states that the total fuel consumption for the year, excluding the warming of the gasholder, was 87 lbs. per 1000 cubic feet of blue water gas produced. Yet this generator has no "complex thermal side."

Presumably based on the foregoing, Mr. Dellwik re-asserts that "blue water gas" can be produced (and is produced) at a cost of 3½d. or less per 1000 cubic feet." But his courage fails, and he adds the remarkable qualification [my italics], "*leaving out of the question such charges as are beyond the control of the constructors of the water-gas plant.*" With such a definition, very little cost need remain. Yet, with a discrepancy of 115 per cent. between his figure and the truth, he does not scruple to contrast this "cost"—in a Dellwikian sense—with carburetted water gas costing "from 14d. to 18d. or more per 1000 cubic feet."

Mr. Dellwik twice explains that his efforts, and those of his associates, are in a direction different from mine—"viz., the introduction of blue gas as an adjunct to coal gas manufacture." But, as one-quarter of his entire communication is devoted to the carburetted water gas plant at Cleethorpes, his attitude seems somewhat in the nature of a "straddle."

Apropos of the Cleethorpes installation, he states that I have lost sight of the Wilkinson (or "Mutual") carburetted water gas process, which is the name given to the Tessie du Motay system, with Dr. Wilkinson's reverse-make attachment to the blue gas generator. On the contrary, I can inform him that the United Gas Improvement Company has recently displaced the Wilkinson process at Newark and at Hoboken with Lowe plants for 7,500,000 and 3,500,000 cubic feet a day, and is displacing the Wilkinson process at Baltimore and the New York Mutual works (to which Mr. Dellwik refers) with Lowe plants for 12,000,000 and 8,000,000 cubic feet daily. This, I believe, still leaves three minor Wilkinson installations in precarious existence.

The Tessie du Motay, or "generator-retort" system has done good work in its day; but it has had its day. It is in no sense a "fake" process. It is obsolete simply because it has been displaced by better and more economical methods—all as indicated in my previous statement.

I cannot accept figures advanced by Mr. Dellwik; but, on his own showing, the coke required for the oil-retorts at Cleethorpes is over 4 lbs. per gallon of oil used. Nevertheless, in deducing his fuel figure for blue water gas by the Lowe process, he deducts "at least 25 to 30 per cent." from the volume of carburetted water gas produced, and charges the residue of 70 or 75 per cent. with the whole of the fuel fed into the generator. In other words, when creating his blue gas comparison, he denies that the gasification of "at least 25 to 30 per cent." of oil gas (representing from 3 to 3½ gallons of oil per 1000 cubic feet) requires any fuel whatsoever.

Mr. Dellwik's reasoning is not robust, when he ascribes my "vindictive statements" to intolerance of "differences of opinion." In self-interest, I prefer such differences to imitation. The Dellwik generator manifestly causes me less "inconvenience" than competing Lowe plant. I could wish him well with his blue gas, if he played the game; and I have perhaps tolerated his misrepresentations longer than I would such conduct where no "differences of opinion" exist.

I have followed Mr. Dellwik through the devious ways by which he seeks to evade my exposure of his methods, in order to show the hollowness of his self-appointed side-issues. The result is that my indictment has been confirmed at every point.

Even his closing wit misses its application by some 1500 years. He mistakes the Law of Moses for Christian Charity, and confuses "false prophets of eld" with erring wives of a later era. As to the former, the only "Biblical qualification"—or, rather, instruction—was to throw straight; and I submit that I have made a bull's-eye. On the other hand, if our "false prophet" insists upon judgment under the New Testament, he will not benefit by restricted missiles; for—if I remember aright—they dropped dead, without ministrations on the part of bystanders.

III. "CALIFACCION," in his letter of March 3, following his letter of Feb. 12, considers that neither my "original article nor the reply thereto has added anything whatever to the general store of knowledge bearing on the matter in dispute." He is correct as to Mr. Dellwik's reply; but, if he finds only "recrimination" in my original statement, I fear we must differ as to what is in dispute, or as to the general store of knowledge bearing on the matter. As I appear to have inaugurated the "dispute," and claim a share of this "store of knowledge," he may permit me to hold my own views:—

(1) The *raison d'être* of my statement was Mr. Dellwik's letter of Jan. 10, regarding blue water gas at Ilford, the fallacies in which were left uncontradicted.

(2) The specific object of my statement was to show: (*a*) that Mr. Dellwik was using a fictitious cost for blue water gas at Ilford; (*b*) that he was deducing fictitious fuel results for blue water gas by the Lowe process; therefore, (*c*) that his claim for novel economy is a myth.

(3) The result of my statement has been to prove: (*a*) that blue water gas at Ilford costs about 7½d., not 3·48d., per 1000 cubic feet; (*b*) that he deliberately advocates an exposed method of deducing fictitious fuel results from the Lowe process; hence, (*c*) that the Dellwik claim for novel economy rests upon misrepresentations, grossly to the advantage of his own performance and to the disadvantage of the performance of others.

I therein fully accomplished my purpose; and if I have not increased "Califaccion's" knowledge—he has my sympathy.

Although "Califaccion" thinks it "futile referring to thermal efficiencies," others may be more readily convinced by the proper application of harmonized laws than by claims for a performance not in keeping with such laws. The man who believes only what he sees, and generalizes from an apparent instance, sometimes sees what is not, or fails to see what is.

(4) Therefore, after an historical statement, I broadly disposed of the Dellwik case—not only at Ilford, but elsewhere—by an explanation of generator technology.

If "Califaccion" can overcome his objection to thermal efficiencies, he may even find therein some addition to his "store of knowledge."

(5) Finally, as Professor Lewes, for his own purposes, has gone out of his way to proclaim publicly the thermal inefficiency of the Lowe process, compared with the Dellwik generator, I have disclosed the worthlessness of his testimony on the subject.

There is something in "Califaccion's" main contention, enunciated in both of his letters, although he does not express it very happily. It is hardly credible that any reader of my statement should suggest that I am struggling with my "newer competitor" for the privilege of introducing blue water gas. I was at some trouble to explain that the "cheap-gas craze" in America antedated the disease in this country by some fifteen years, with the object-lesson, supplemented later by every consideration of reason, that to "cheapen" coal gas by dilution is rank commercial heresy. On the other hand, I also explained that, at the present time, "the Dellwik faction are merely applying to simple blue gas generators the principles which for the past fifteen years have been successfully adapted to the dual and complex purposes of the Lowe generator."

Nevertheless, I willingly submit to "Califaccion's" test. I infer from his statement, "in addition, we all have the results of our own work" with the Lowe system, that he is using Lowe plant. If it be a Humphreys-Glasgow plant, and he will place it and his coke pile at my disposal, I will gladly accept his invitation to demonstrate its blue gas working; but I will not continue this journalistic discussion with an anonymous correspondent.

IV. The vain imaginings of Dr. P. DVORKOVITZ are beyond treatment. He should "buy the truth, and sell it not; also wisdom, and instruction, and understanding."

FANS IN GAS-WORKS.

As a supplement to Part III. of his series of articles, on "Fans in Gas-Works" (the latter half of which was published last week, pp. 622-25), Mr. R. Gordon Mackay, Assoc.M.Inst.C.E., sends the following:—

Indicator Diagram.—Fig. 20 shows a diagram taken from the engine when making 71 explosions per minute and giving 62 indicated horse power. For the tests 1 to 3 inclusive, and the brake test, the mean effective pressures as taken from the indicator cards were 103·5, 106, 107, and 104 lbs. per square inch

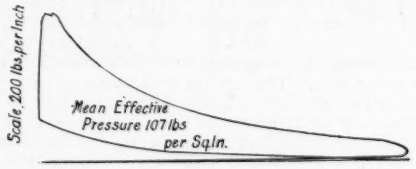


FIG. 20.

respectively. The gas consumed during the 2½ hours' duration of the tests was 1750 cubic feet; the avearge indicated horse power of the engine being 51·7—giving a consumption of gas per indicated horse power per hour of 13·6 cubic feet. This is a very fair result with gas of about 640 British thermal units per cubic foot. During test No. 5, the mechanical efficiency of the fan was 48·51 per

cent., and the consumption of gas per indicated horse power per hour was 11·05 cubic feet.

Fan Exhausters for Private Consumers.—Widely differing in their size, but closely allied in their application to gas exhausting, are the small fans used for supplying a mixture of illuminating gas and air under pressure direct at the consumers' burners. The writer was present in the beginning of November, 1902, at some interesting tests made in the laboratory of the Selas G.M.B.H., Berlin, Höchstestr, when a fan with a 2 inch diameter inlet and outlet, and a wheel of about 15 inches diameter, sufficed for the hourly passing of about 133 cubic feet of gas and 400 cubic feet of air into a weighted holder. The fans, of which a large number are now being made for the Selas Company, are fitted with oil-ring bearings, and run at a speed of about 3500 revolutions per minute. An electrical contrivance automatically stops or starts the fan when the holder is either nearly full or nearly empty. The above test was with a 100-burner apparatus.

TECHNICAL RECORD.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of this Association was held on Friday, at the Polytechnic Institute, Regent Street. The President (Mr. Walter Grafton, F.C.S.) occupied the chair, and he was supported by a goodly number of members, who had assembled to hear read the first paper contributed to the Association's "Proceedings." The distinguished honour of thus leading the way fell to the lot of Mr. A. V. Hendrickson, of the Crystal Palace District Gas Company, who chose for the subject of his communication a matter of considerable importance at the present time—namely, "The Determination of the Heating Value of Gas"—in connection with which he had recently been making some experiments by means of a Jünkers calorimeter. The object of these experiments was to ascertain the results obtained when supplying the burner of the instrument with varying quantities of air, and the difference (if any) when the gas consumption or the rate of flow of water through the apparatus was altered.

After giving a full description of the apparatus referred to and the method of working it, Mr. Hendrickson went on to explain that the first tests were conducted in order to see whether the results would be similar when burning a small and a large quanty of the same gas; and the figures obtained showed that a small amount of gas (equivalent to 2 litres of water passing through the instrument) gave a higher value than when a large quantity was burnt (say, equivalent to 10 litres of water). This might probably be explained by the fact that in the short test there was less liability of error; or was it because such a test did not represent a fair average sample of the gas? The average of the tests showed that the small quantity of gas (0·184 cubic foot) gave 617 British thermal units per cubic foot gross and 551·9 net; while the larger quantity (0·902 cubic foot) gave 605·4 British thermal units per cubic foot gross and 544·5 net.

The author next gave a table showing the result of altering the air supply to the burner, the rate of consumption of gas remaining the same. With a maximum air supply—*i.e.*, the air-inlet full open, the flame having a sharp green inner cone and slightly "roaring"—an average value of 618·4 British thermal units per cubic foot gross and 554·2 net was arrived at; while with a minimum air supply—*i.e.*, the same flame, but supplied with only just sufficient air to render it non-luminous—the results were 622·8 and 560·9 units respectively. Tests were also made to ascertain the results obtained with different degrees of heat. The usual recommendation was that the difference in temperature between the incoming and outgoing water should range from about 10° to 20° C. The effect was, however, tried of having a difference of only 3°, and then gradually increasing the flame, or decreasing the supply of water, till a difference of 40° was obtained. But as only one series of tests had so far been undertaken, Mr. Hendrickson preferred to leave these to be dealt with on some future occasion.

Experiments were next made with producer gases taken from immediately above the fire in a regenerative setting. The holder used for their collection being between twenty and thirty yards from the furnaces, an iron pipe was placed through a nostril-hole in the furnace-arch, and the gases drawn into the holder by placing weights upon it so as to cause a vacuum. The table showing the results obtained, which are of special interest just now, is given below, as is also another dealing with the calorific value of "blue" water gas (unpurified).

A further table showed the different calorific values obtained with various gases (coal and carburetted water gas—the percentage of the latter remaining practically the same) having approximately the same illuminating power. These ranged from 595·5 British thermal units per cubic foot gross and 537·9 net for a gas of 15·44-candle power, to 643·5 and 573·6 units respectively for one of 15·81-candle power. From the figures he had given, the author said it was evident that if in the future calorific power was to be the standard, a fairly wide margin would have to be allowed. To ensure comparative results being obtained from each works, the calorimeter would have to be standardized. As a means of doing this, in the absence of rules to ensure absolute uniformity in its construction, he suggested that a factor should be found for each instrument by the testing of a gas whose calorific value was known with certainty. The most suitable gas for this purpose was hydrogen—this being preferable to pentane air-gas, inasmuch as it was an elementary gas, and, when pure, of uniform composition, whereas with a mixture errors were likely to be introduced.

Partial Analysis and Calorific Value of Producer Gases taken from immediately above the Fuel Bed in a Regenerative Furnace.

Partial Analysis of the Gas Percentages by Volume.			British Thermal Units per Cubic Foot.	Remarks.
Carbonic Acid.	Oxygen.	Carbonic Oxide.		
				No water of condensation, and gas burnt about 0·65 cubic foot.
2·4	0·4	26·6	120·3	
2·8	0·4	23·0	92·5	,,
2·6	0·5	21·0	85·3	,,
5·8	0·4	21·4	81·8	,,
4·8	0·4	22·1	84·9	,,
2·6	0·4	21·0	109·6	,,
2·2	0·4	27·4	128·6	,,
2·8	0·8	24·6	120·0	,,
2·4	0·6	27·6	131·4	,,
3·15	0·50	23 85	106·0	,,

Calorific Value of "Blue" Water Gas (Unpurified).

Average Consumption of Gas per Hour.	British Thermal Units.		Remarks.
	Per Cubic Foot. Gross.	Per Cubic Foot. Net.	
8 feet	344·2	313·2	Containing on an average 3 per cent. of Carbonic Acid.
	307·6	293·0	
	323·6	295·8	
	335·4	306·9	
	320·8	289·0	
	344·6	311·6	
	324·3	295·4	
	328·6	300·7	

At the conclusion of the paper, a short conversational discussion took place. Mr. Grafton said he noted that Mr. Hendrickson made experiments with a 2 litre quantity and a 10 litre quantity of water. In making the comparison between the two, where he showed from the tests given a difference by taking the small and the large quantity of gas—that was, measuring the 2 litre quantity as compared with the 10 litre quantity of water—was the water in both cases heated to exactly the same degree? Mr. Hendrickson replied that it was. With reference to the tests of "blue" water gas, Mr. Grafton remarked that the results as a whole were rather satisfactory; but it seemed to him that 344·2 British thermal units per cubic foot gross was somewhat high, considering the gas was not purified. As to the illuminating gas, it was quite clear to him from the figures that what was used was not coal gas but a mixture of carburetted water gas and coal gas. Therefore, he was not surprised to find that the results were up and down, because they could not in working ensure the percentage of water gas added, and much depended upon the constitution of the mixture as to what the gross and net value would be. In reply to a question as to why it was necessary for the calorimeter to be standardized, Mr. Hendrickson said that he thought, if it was essential for the burner to be standardized, it was quite as needful for the calorimeter to be. With reference to the producer gas tests, the fact that no water of condensation, was obtained was strange, but true. As to the illuminating gas experiments, the tests were taken so that, in practical working the percentage of water gas was the same in every case; the differences in illuminating power being caused by fluctuations in the coal gas.

A hearty vote of thanks was accorded to Mr. Hendrickson for his paper.

Dr. H. E. Schunck, of Manchester, whose death was noticed in the "JOURNAL" for Jan. 20, left estate of the gross value of £148,034, including personality of the net value of £132,654. He devised a piece of land adjoining Oaklands (his residence at Higher Broughton), on which his laboratory is built, to the Owens College, Manchester, for a term of 25 years after his death, subject to the payment by the College of a rent of £60 a year. He bequeathed to the College, in trust for the foundation of a "Dr. Schunck's Endowment for Promoting Chemical Research," the contents of the laboratory, and the apparatus and appliances and instruments, to be administered by the Principal and Professors of Chemistry and by two other Trustees, to be nominated by the Council, and by his son Mr. Charles Adalbert Schunck.

WORKING AN ILLUMINATION PHOTOMETER.

At the Meeting last Saturday week of the Manchester District Institution of Gas Engineers, Mr. HENRY FOWLER, M.Inst.C.E., of the Midland Railway Co., Derby, read the paper he prepared for the previous quarterly meeting (see "JOURNAL" for Dec. 9, 1902, pp. 1541-43) as well as the following addendum :—

In some appreciative remarks that one of our leading technical papers made on the paper just read, it was suggested that a few curves of good outdoor and indoor lighting would be acceptable. I have endeavoured to obtain some slight record of these classes of lighting, but regret that want of time, if not of opportunity, has prevented them being as full as I would have liked.

Thanks to the courtesy of Mr. J. G. Newbigging, the Gas Engineer to the Manchester Corporation, I was able to take a few readings round the Technical School of this city. These are shown in fig. 7, and should prove of interest, as I think that most will agree that the lighting round the building will bear comparison with that of any street in the world. It will be seen that portions of the curves, shown by dotted lines, have had to be assumed, as the range of the photometer was not high enough to include the lighting so near the lamps.

Fig. 8 shows a plan of the lighting; the curves being taken between the lamps A and B in Whitworth Street and E and F in Sackville Street. In each case, the readings were taken along the pavement on a line parallel to that joining the lamps, but 6 feet from it. Lamps A and B in Whitworth Street are 80 feet apart, while in Sackville Street the distance from E to F is 60 feet. This shorter spacing (due to it being the way to the main entrance) accounts for the much higher curve of illumination, which did not fall below 0·8 candle-foot.

In order to show the evenness of the lighting, a reading was taken at C, in the middle of the road, half-way between A and B; this being found to be 0·47 candle-foot. At D, in the centre of the road, and three-quarters of the way between A and B, the reading was 0·52 candle-foot. It should be said that the roadway of Whitworth Street is about 36 feet wide; and the lamp-columns stand on the pavement 3 feet from the curb. The bottoms of the mantles are 13 ft. 1 in. from the pavement, while the screen of the photometer stands 8 inches above it.

The lamps are, as most probably know, of the high-pressure type, with three burners. They are worked at a pressure of 8 inches of water, obtained by a pair of Keith's compressors. Mr. Newbigging informs me that on the bar in the photometer-room the burners give 30 candles per cubic foot, and that the cost of 1000 candles—including gas, maintenance, and interest on capital—is only 1·67d. per hour. I regret Mr. Newbigging is not here to speak of this truly magnificent piece of lighting himself; and I should say that he and his people were wholly unaware of which night I intended making a test.

As an example of inside lighting, on fig. 9 are shown three curves taken 8 inches from the floor of the Drill Hall, Derby. It

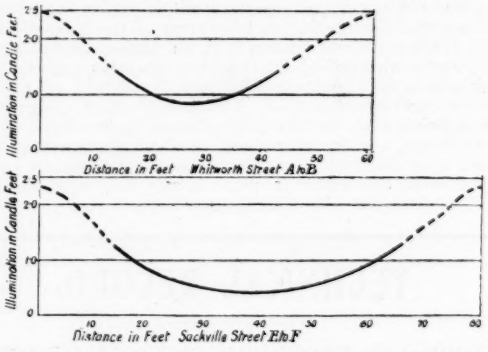

Illumination in Candle Feet
Distance in Feet Whitworth Street A to B
Illumination in Candle Feet
Distance in Feet Sackville Street E to F

FIG. 7.—LIGHTING ROUND THE TECHNICAL SCHOOL, MANCHESTER.

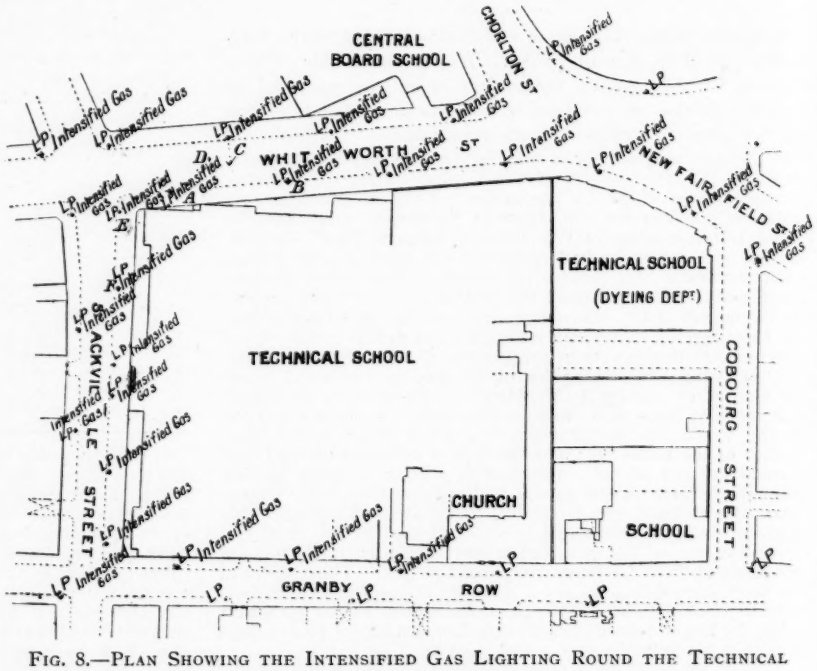


FIG. 8.—PLAN SHOWING THE INTENSIFIED GAS LIGHTING ROUND THE TECHNICAL SCHOOL, MANCHESTER.

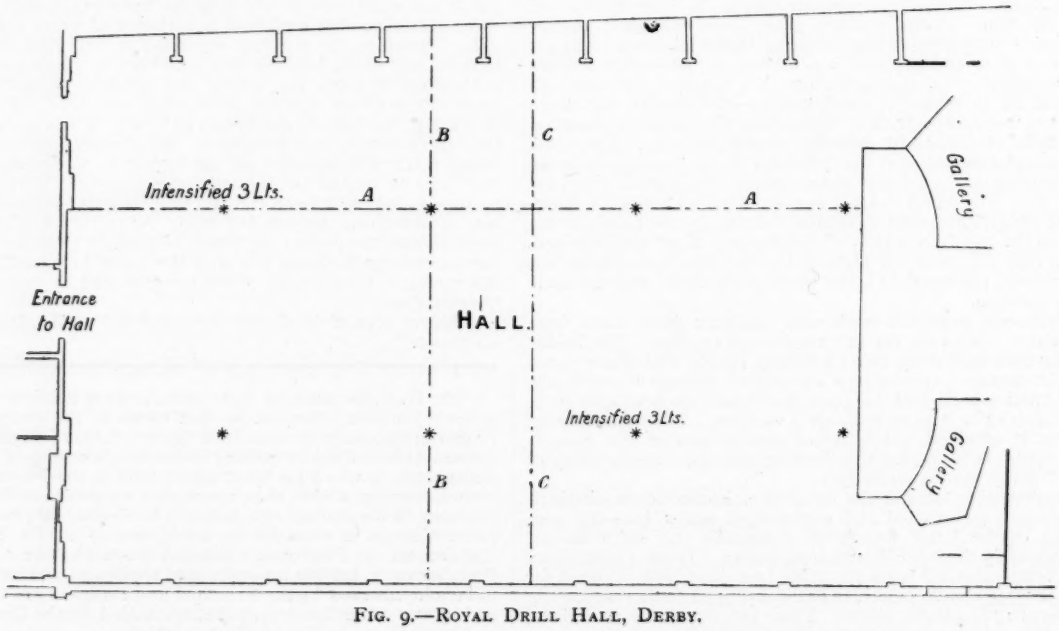


FIG. 9.—ROYAL DRILL HALL, DERBY.

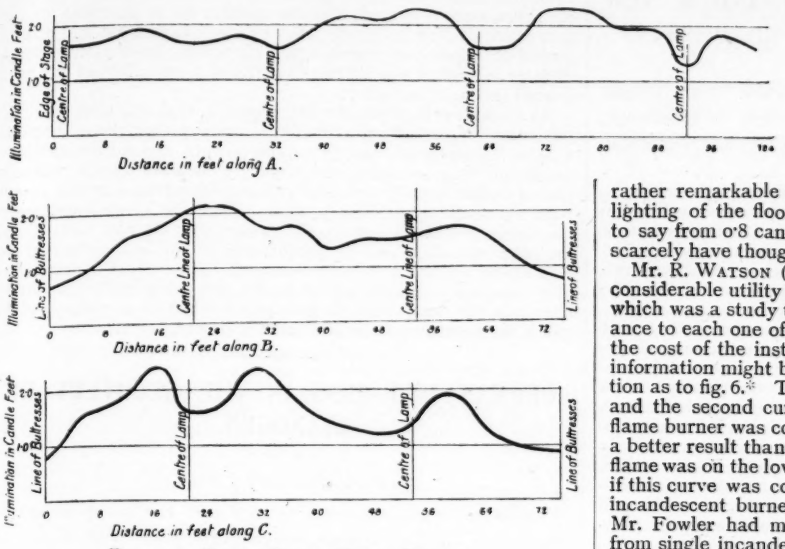


FIG. 10.—ROYAL DRILL-HALL, DERBY.

is a large building (see fig. 10), about 116 ft. long by 75 ft. wide, and is lighted by eight three-cluster large incandescent lights, of the Welsbach self-intensified pattern, with reflectors. The bottoms of the mantles are 17 feet from the floor-level; and the lights are 30 feet apart lengthways, while the rows are 32 feet apart. Three curves are shown on fig. 9—viz., one (A) along the hall under a row of four lights, another (B) across the hall under the lights, while the third (C) is across the hall between the lights. There was considerable difficulty in getting these curves, owing to the trouble of putting one's body and legs in such a position that no shadow was cast on the screen. The dip in the curve under the lamps is due to the interference of the burners themselves.

It might be pointed out in connection with these curves that, although it would seem from the diagrams that the illumination varied considerably, yet this cannot be noticed in the hall, where the floor appears to be perfectly evenly illuminated. The author would draw attention to the fact that it is a most difficult matter to judge with the eye the illumination of two parts of a space. This is particularly so if the change of illumination is gradual; and this is a point which requires far greater attention than it has received. Every effort in all cases should be used to prevent "spottiness" in illumination, which particularly has to be guarded against in these days of lighting with high units of light, which can only be satisfactorily used to give even lighting surfaces, by placing some distance away from the body to be illuminated.

Discussion.

Mr. H. TOWNSEND (Wakefield) said, as he had the privilege of introducing Mr. Fowler to the Institution, he rose with very great pleasure to congratulate him upon his excellent paper. It was on a subject which he (the speaker) thought had never been hitherto treated upon by the Institution; and he was afraid the members were hardly qualified to discuss it to any great advantage. So far as his recollection went, the transactions of the Institution were singularly free from mathematical expressions, and such terms as "sines" and "co-sines," and they welcomed these terms to their transactions. They certainly to some extent improved the appearance of them. (Laughter.) With regard to the additions to Mr. Fowler's paper he thought they were of very great interest indeed. The excellent bit of lighting to which reference had been made was no doubt familiar to them all; and it was a very great advantage to be able to refer their various constituents to it. The curves exhibited were surprising. One would not have anticipated there would have been so much variation in the lighting of the floor-space of a building like the Derby Drill Hall. The apparatus Mr. Fowler had put before them was certainly ingenious and interesting; and now that attention had been publicly drawn to it, perhaps it might get so much improved as to overcome the difficulties that were apparently inherent to it in its present form. If this could be accomplished, it would be a great advantage to them all. He concluded by expressing his acknowledgments to Mr. Fowler; and he hoped that now that he had broken the ice, they would have many more papers from his pen.

Mr. J. C. BELTON (Chester), called upon by the President, said he had been deeply interested in the excellent paper that Mr. Fowler had presented to them; and he certainly thought there was a future of utility for such an instrument in the gas profession. It must be of very great use in ascertaining the extent of the efficiency of their public and private lighting. Mr. Fowler was to be congratulated upon the way in which he had placed the matter before the members.

Mr. J. H. BREARLEY (Longwood), also invited by the President, said he could only add that he too appreciated the paper very much. It had made him think that Mr. Fowler was a bit ahead of gas managers in experimenting on the lighting of buildings and streets. As Mr. Townsend had said if this instrument could be improved, there was no doubt it would be of great utility to them. Some of them would then be able to test the instrument themselves; and for that purpose Mr. Fowler's paper would be looked upon as the best thing to read before going into the matter more fully. He agreed with Mr. Townsend that it seemed rather remarkable that there should be such a difference in the lighting of the floor space of the Derby Town Hall—that was to say from 0·8 candle-foot to nearly 2·5 candle-foot. He should scarcely have thought there would have been this difference.

Mr. R. WATSON (Doncaster) said this instrument was one of considerable utility to gas engineers in the study of street lighting, which was a study that was becoming of more and more importance to each one of them. If Mr. Fowler could oblige them with the cost of the instrument and perhaps the makers' name, the information might be of service. He should like a little information as to fig. 6.* The first curve was that for a flat-flame burner, and the second curve for an incandescent burner. The flat-flame burner was consuming 8 cubic feet an hour, and was giving a better result than the incandescent burner. Of course, the flat flame was on the lower post and nearer the disc; but it appeared, if this curve was correct, there was a disadvantage in using an incandescent burner. He would also be glad to hear whether Mr. Fowler had made any contrasts between curves obtained from single incandescent burners and high-power burners such as was shown in the diagram referring to Whitworth Street and Sackville Street. It would appear, comparing fig. 6 with the one referring to the streets named, that, taking into consideration the cost of the gas used in the burners that the high-power system of lighting was infinitely more expensive than the smaller unit. In addition to this, if the high-power lamps were spaced so as to bring down the cost to about that of single or double incandescent burners, they would get bigger extremes of light and comparative darkness—that was to say, using high-power lights in long streets as compared with small units of light spaced closely together. He (Mr. Watson) thought the paper would stimulate the members, when they could obtain these photometers, to make studies of lighting, and particularly of street lighting.

Mr. FOWLER, in reply, said he regretted that Mr. Townsend had thought his paper mathematical, as he had endeavoured to keep mathematics out of it as much as possible. Mr. Townsend and others had spoken of the defects of the photometer he had described; but of these there were only two. The colour of the amylacetate flame was one. But this grew less as one's experience in matching colours increased, and by making a number of constantly decreasing oscillations of the screen, a very true position could be arrived at. The other difficulty was that of wind affecting the flame; but this, of course, did not matter with inside work. In the open, it undoubtedly was awkward to go any distance to take the illumination, and then find the wind was too strong. But if the result of lighting in one's own town was required, one could always pick a calm night. He thought that, by altering the ventilation, this trouble might be entirely remedied. One of the reasons these instruments were not more extensively used was undoubtedly the fact that many were unaware of their very existence. There were other types on the market, including the one recently brought out by Messrs. Simmance and Abady; but he thought the Preece and Trotter instrument which he had described was probably the most compact and the handiest. Mr. Brearley had expressed surprise at the variations in the illumination of Derby Drill Hall, particularly when taking into account the position of the lights. He thought, however, that it was not at all other than one would expect when it was borne in mind that the height of the lamps was little more than half of their distance apart. The illumination on the floor, of course, not only depended upon the square distance from the light, but upon the angle at which the rays hit it. It was often difficult to judge of variation of illumination when the ratio was as high as 3 to 1 or even 4 to 1 when the change was gradual. Of course, if the lights were near the floor, the change of illumination took place quickly; and the result was "spottiness," which one often noticed in some classes of lighting. The makers of the photometers mentioned were Messrs. Nalder Bros. and Co. of Carteret Street, S.W.; and he had to thank them for the drawing from which fig. 2 was prepared. The cost, he believed, was £13 10s. including the tripod, box, &c. Mr. Watson had wondered at the difference between the curves on fig. 6; but it must be remembered that the flat-flame light was on a pillar 9 feet high, while the incandescent was nearly 12 feet from the ground. This, of course, caused the latter to give far less illumination near the pillar, but to make the lighting more uniform, which was what one had to aim at in street lighting. With regard to the question of single incandescent burners as compared with high-pressure lighting, he hoped that the few figures he had given would enable the members to work out any particular instance they might think fit. In order to get uniform lighting with a high unit of light, it was, of course, necessary to have the light high up, if even illumination in a horizontal plane was aimed at. In one case he had charge of, the burners were between 23 and 24 feet up; and the result for general lighting was very good. Of course, if lighting in a vertical plane was desired, it was a different matter altogether.

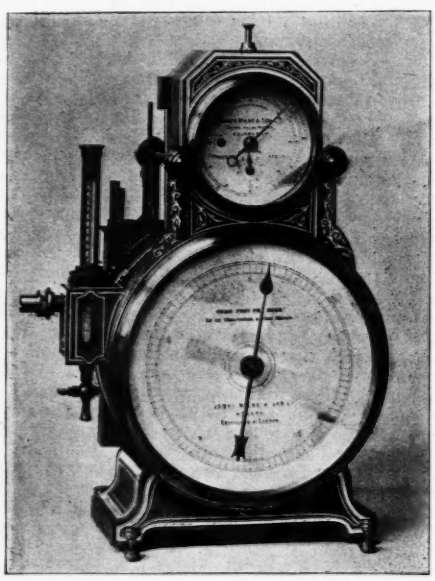
*See "JOURNAL," Vol. LXXX., p. 1543.

THE MEASUREMENT OF LIGHT AND A NEW PHOTOMETER.

On Monday last week, Mr. HENRY O'CONNOR, Assoc.M.Inst. C.E., of Messrs. James Milne and Son, Limited, of Edinburgh, read a paper on the above subject before the Royal Scottish Society of Arts.

The author began by describing the early types of photometers, and went on to say that the Letheby-Bunsen photometer was the survival of the fittest, using the bunsen disc as the means of judging the light thrown. By the aid of apparatus which had been fitted up in the lecture room, explanations were given with regard to the working of the Letheby-Bunsen photometer, the Referees table photometer, the extra-rapid photometer (an invention of Mr. O'Connor's), the simple jet photometer, and of a jet photometer designed by Mr. O'Connor. The last-named shows the pressure required to give a fixed height of flame. The apparatus is very delicately made, on the same principle as a chemical balance, with steel knife edges working on agate centres. The first of these pressure indicators was ordered by, and made for, the Board of Trade Standards Department, and is used by them for testing the accuracy of the ordinary King's gauge. Variations in the level of the water cause no variation of indication. There are no strings to expand. It is always ready and set; and it can be used on bar photometers to indicate the pressure at the burner.

Turning to standards of light, descriptions were given of the manufacture of candles, and of the methods of using them, of the Methven screen, Sugg's 10-candle standard, Harcourt's 1-candle pentane unit, and of Harcourt's 10-candle pentane unit lamp. The French and German standards of light were also described. The tables which Mr. O'Connor has prepared to enable the variations in temperature, barometrical pressure, and tension of aqueous vapour to be readily calculated, and which he laid before the North British Association of Gas Managers a few years ago, were shown on the screen. Mr. O'Connor then



O'CONNOR'S PATENT BLOCK METER.

showed his own patent plunger meter, in which, by altering the level of the water in the meter, it is made to register fast or slow, and the pointer then shows the corrected quantity. Thus all calculations for corrections due to temperature, barometrical pressure, and tension of aqueous vapour, are avoided—a step in the reduction of the difficulties of photometrical work. The working of the meter was explained; and the author then described his automatic block meter, which is a further improvement designed by himself originally for the Referees table photometer, and since adopted for the extra rapid photometer.

The meter contains the means already described for correcting for temperature, &c. But it contains also other gearing, which, when a button is pressed, starts the clock and connects it with the meter; and when the required quantity of gas has passed through the meter, the clock is automatically stopped. The required quantity is two-twelfths of a cubic foot of gas, or two exact revolutions of the cylinder of the meter. When the meter is in use, the standard and the gas to be measured are lighted for the prescribed time before the test is started. The gas is turned down, and then gradually raised until the two beams of light are considered equal, and a mark is made on the scale of the quadrant cock where the pointer is found to be. The gas is then turned up too high, and gradually reduced until the beams of light are again considered equal, and a second mark is made on the scale. It will be found that these marks very rarely coincide. The two operations are repeated, and the pointer set to the mean of the four marks. The button to start the clock is pressed, and after a period of about two minutes, the clock will automatically stop. This occurs when exactly two-twelfths of a cubic foot of gas have passed through the meter.

As no further corrections are required, and the time taken to consume the gas indicates the illuminating power, the author had a second scale graduated in candle powers, around the ordinary circle showing seconds, and each 7·5 seconds equals 1-candle power with 16-candle gas, and 4·18 seconds equals 1-candle power with 25-candle gas. The position where the clock hand stops thus indicates the exact candle power without any calculation, and the operation can be performed by any man with an eye capable of adjusting the two beams of light. Mr. O'Connor has also adapted the same principle for the durability test; but in that case the time taken to pass one-twelfth of a cubic foot of gas is the measure of the illuminating power.

GERMAN PROGRESS IN THE RECOVERY OF CYANOGEN.

(*Continued from p.* 640.)

There is no free ammonia in the gas; but the presence of ammonium sulphide has to be reckoned with. This is not in the form of the monosulphide, but as hydrosulphide; and before the latter can contribute to the formation of sulphocyanide, it must first be converted to monosulphide, and the latter to the polysulphide. All the conditions for these changes prevail. The presence of iron compounds initiates the action on the ammonium hydrosulphide, thus—

(11) [*a*] $2\,NH_4SH + Fe_2(OH)_6 = 2\,Fe(OH)_2 + (NH_4)_2\,S + S + 2\,H_2O.$

[*b*] $(NH_4)_2\,S + S = (NH_4)_2\,S_2$

[*c*] $(NH_4)_2\,S_2 + HCN = NH_4\,CNS + NH_4\,SH$

Thus, in this case, the formation of sulphocyanide is a tertiary action. The ferric oxide effects the splitting off of free sulphur, and produces the monosulphide from the ammonium hydrosulphide, and ferrous oxide is formed. The monosulphide combines with the free sulphur, yielding polysulphide, and the latter yields with the hydrocyanic acid ammonium sulphocyanide, while ammonium hydrosulphide is re-formed. But though the ferric oxide is the principal medium in the formation of sulphocyanide, the conditions also exist for its formation by another set of reactions. Favoured by the presence of iron compounds, the oxygen present in the gas acts on the ammonium sulphide thus—

(12) [*a*] $2\,NH_4SH + O = (NH_4)_2S + H_2O + S$

[*b*] $(NH_4)_2S + S_2 = (NH_4)_2S_3$

[*c*] $(NH_4)_2S_3 + 2HCN + O = 2\,NH_4CNS + H_2O + S$

Here, again, the formation of sulphocyanide is a tertiary occurrence. As, however, the oxygen in the gas plays only a subordinate part, the reactions shown under (12) have not much influence in the recovery of cyanogen from coal gas, though they are of great importance in the recovery of cyanogen from coke-oven gases.

Explanation of the curious behaviour of the oxide to which ferrous sulphate had been added does not appear so simple. But on considering that there are in the absorbent, besides the ferrous sulphate, also ferric oxide, iron sulphide, and sulphur, and in the gas, besides the ammonia and hydrocyanic acid to be absorbed, about ten times as much sulphuretted hydrogen and some oxygen, it becomes quite intelligible that it is not a question of so simple a reaction as the mere neutralization or combining of the ammonia to form the sulphate, and the formation of ferrous cyanide from the hydrocyanic acid. Along with the ammonia and hydrocyanic acid, there are ten times as much sulphuretted hydrogen and some oxygen ready to react with the mixture of ferric oxide, ferrous sulphate, iron sulphide, and sulphur. Different actions occur simultaneously. From the ferric oxide and sulphuretted hydrogen, ferrous oxide and free sulphur are formed. But while oxygen and sulphuretted hydrogen act on one another but little in the comparatively diluted state in which they occur when the gas enters the purifier, their tendency to react increases very much as soon as iron compounds are present. Probably iron sulphide and ferric sulphate are produced as intermediate bodies, which then act on one another, and yield ferrous sulphate again while sulphur is separated, thus—

(13) [*a*] $3\,FeSO_4 + O + H_2S = Fe_2(SO_4)_3 + FeS + H_2O.$

[*b*] $Fe_2(SO_4)_3 + FeS = 3\,FeSO_4 + S.$

[*c*] $3\,FeSO_4 + O + H_2S = 3\,FeSO_4 + S + H_2O.$

In any case, from the mixture of sulphuretted hydrogen and oxygen, when iron compounds are present, free sulphur is produced. But as the ammonia exists in the gas mostly as hydrosulphide and carbonate, and only to a small extent as ammonium cyanide, it follows that the greater part of the ferrous sulphate is converted into iron sulphide, while ammonium sulphate is formed, thus—

(14) $2\,NH_4SH + FeSO_4 = (NH_4)_2SO_4 + FeS + H_2S.$

But it has already been stated that sulphide of iron cannot

absorb hydrocyanic acid by a primary reaction; and hence there again occurs here the action of the mixture of ammonium sulphide and hydrocyanic acid on iron sulphide shown by the equations [10]. Ferrous cyanide and ammonium monosulphide are formed by a secondary reaction, and thence, by the action of the sulphur which is separated from the sulphuretted hydrogen by the ferric oxide and oxygen, there results, as a tertiary product, ammonium sulphocyanide. Thus the, at first sight, anomalous occurrence of the loss of cyanogen through the formation of sulphocyanide being equally high under the very different conditions of experiments (2) and (3) is quite explicable. In both cases the formation of sulphocyanide is due to the same tertiary reaction. The formation of sulphocyanide will be inconsiderable if the absorption of the ammonia and hydrocyanic acid is effected by material which is free from ferric oxide and the free sulphur which occurs therewith. There is then produced only as much sulphocyanide as corresponds with the amount of oxygen in the gas. Thus more sulphocyanide will result under these conditions from coke-oven gases than from coal gas.

These explanations are quite in accordance with the facts established analytically and experimentally by Dr. Leybold's work. But they also render the practically observed fact that very little sulphocyanide is produced in the ammonia washers quite intelligible. The small amounts of sulphocyanide which actually occur are formed in the ammonia washers only in consequence of the small quantities of iron sulphide and free sulphur which are always to be found in iron apparatus through which gas containing oxygen and sulphuretted hydrogen is passing. Accordingly, it is of fundamental importance for securing a high yield of cyanogen that the iron compounds used for the recovery of the cyanogen should not be added before or during the ammonia washing, but after it is completed, especially if the gas contains oxygen. This is to a certain extent the converse of Dr. Leybold's dictum of ten years ago, to the effect that good ammonia washing is the most important condition for securing a high yield of cyanogen.

It might be supposed from what has been demonstrated above, that there would be no paramount necessity for removing the ammonia from coal gas before the cyanogen is recovered (because the proportion of oxygen present in coal gas is so trifling), provided the hydrocyanic acid is absorbed before the gas enters the purifiers. Of course, with good gas, the prior removal of the ammonia becomes unimportant. But there is the certainty that a small proportion of oxygen in the presence of ammonia compounds entails a corresponding loss of cyanogen. As, moreover, a certain proportion of oxygen is never wholly avoidable, and is increased by any irregularity in the working, it is undoubtedly preferable to avoid all chance of loss by removing the ammonia before the hydrocyanic acid. When the ammonia has been removed, the oxygen present in the gas does not affect the yield of cyanogen. This fact is of special significance in regard to coke-oven operations. The conclusion is that so long as ammonia is present when hydrocyanic acid is being absorbed by iron compounds, the loss of cyanogen through the formation of sulphocyanide is directly proportional to the amount of oxygen contained in the gas.

The more important fundamental conditions, deduced in the foregoing, for the recovery of cyanogen are briefly summarized by Herr Feld as follows:

1. In order to obtain a high yield of cyanogen, the ammonia must first be removed as completely as possible from the gas. The absorption of cyanogen must not take place until after the ammonia washers.

2. For producing a crude product containing a high proportion of cyanogen, the wet washing method is preferable to absorption in the purifiers.

3. For obtaining only soluble compounds of iron and cyanogen, ferrous salts free from ferric compounds must be used, and must be mixed with at least three times their equivalent of alkali. The mixing must take place in the washer itself, so as to avoid oxidation of the ferrous oxide and the formation of prussian blue.

4. For obtaining only the insoluble compounds of iron and cyanogen, only one equivalent of alkali is used per equivalent of a ferrous compound. These must be run into the washer separately. The formation of ferric oxide must be avoided as much as possible, as the absorption of cyanogen is protracted by ferric oxide, and the product obtained is contaminated with free sulphur.

5. In order to accelerate the rate of absorption of hydrocyanic acid in the washer, the absorbent must not be introduced all at once, but gradually.

(*To be continued.*)

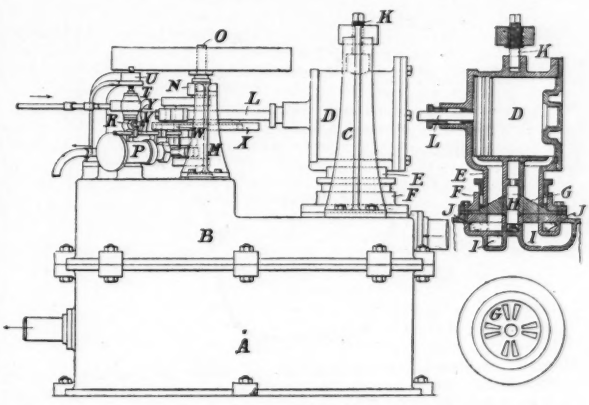
Gas v. Steam Engines.—In the course of a paper read by Mr. J. W. Hall, Assoc. M. Inst. C.E., of Birmingham, before the Staffordshire Iron and Steel Institute, of which he is a Past-President, on "Gas and Other Heat Engines," he expressed the opinion that the steam-engine can only compete with the gas-engine for consumption of fuel in the case of the larger sizes, because to approach it in economy the latter requires much complicated plant in the form of pumps, economizers, superheaters, &c. He considers that the possibility for future improvement in the gas-engine lies in the fact that there is more opportunity of utilizing the heat it contains than with the steam-engine.

REGISTER OF PATENTS.

High-Pressure Lighting Motors.—Sugg, W. T., of Westminster. No. 4802; Feb. 25, 1902.

The patentee has in view to provide a motor for use in increasing the pressure of gas in high-pressure lighting.

A is a cast metal box, which serves as a chamber for the gas under pressure, and on the top of which the pressure-increasing apparatus is mounted. B is a foundation or base provided with an inlet for the gas, which is drawn in by a pump and is forced into the box A; the outlet from the box being at the left side. C are standards on the base carrying a cross-head, between which and the base the cylinder D of the pump for increasing the pressure of the gas is placed. This cylinder (of a type now well known) is arranged to oscillate on its side; being provided with a hollow trunnion E, in which are passages to opposite ends of the cylinder. The trunnion works in a stuffing-box F secured to the base; and the end of the trunnion rests on a cone G, in which are



eight ports—four of which act alternately as inlet ports and four as exhaust ports. To relieve friction, the trunnion is bored out centrally to receive a spring supported pin H, on the top of which the trunnion oscillates on ball bearings. In the base are circular inlet and exhaust passages I J, having ports corresponding to those in the cone G. As the cylinder rocks, the gas is drawn in and forced out, first by one and then by the other sets of ports. K is a steadying pin carried by the cross-head, and provided with a spring to keep the cylinder on its seat.

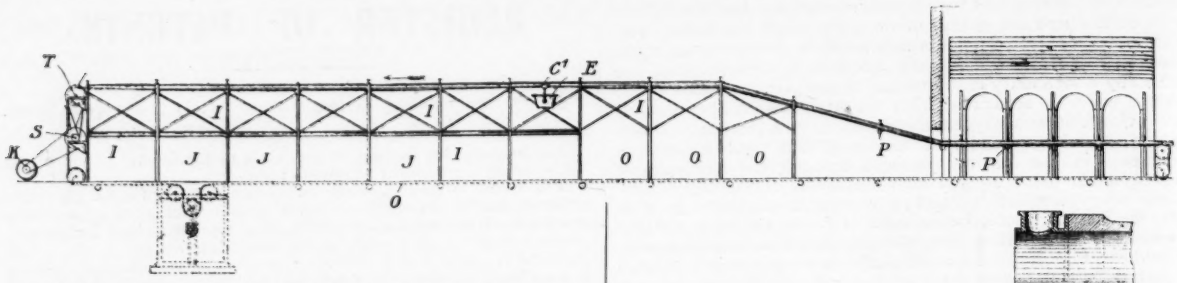
The piston-rod L is connected to a crank, as will now be explained. M are standards on the base carrying a cross-head N. In the base and cross-head are bearings for a vertical crank-shaft O, which is formed with a series of cranks of different throws. To a crank of the largest throw, the piston rod L is connected. To other cranks, which will be all of the same throw, are connected the piston rods of two or more water-motor cylinders P, of a type similar to that of the gas-cylinder D—that is to say, they oscillate on their side; Q being a trunnion working in a suitable bearing on the base. These cylinders are arranged radially round the shaft, and each on a different horizontal plane corresponding to the position of the crank it is intended to serve. Each cylinder is formed with a boss in which are passages to each end of the cylinder, and also a barrel or chamber for a plug-valve R. The boss is also provided with a vertically extending hollow plug S, which works in a chamber T connected by a pipe with the water supply; so that the plug is always open to the inflow of water. The cylinders P are held steady by centre pins working through the cross-head U. The plug valve R is preferably mounted on centres carried by brackets extending from the boss, so that the position of the plug may be regulated to avoid the friction of contact with the barrel. The plug may, in fact, have a slight leakage, which will serve the purpose of lubrication—means being provided to carry off the leakage water.

Working in guides secured to the cylinder, or in any other convenient position, is a slotted rod V, one end of which is provided with a bowl W, which works in a groove of a cam X mounted on the crank shaft. In the slot of this rod works a lever Y, on the stem of the plug-valve R, so that, as the rod is moved backwards and forwards by the rotation of the cam, the plug R will be rocked to change the direction of the flow of water.

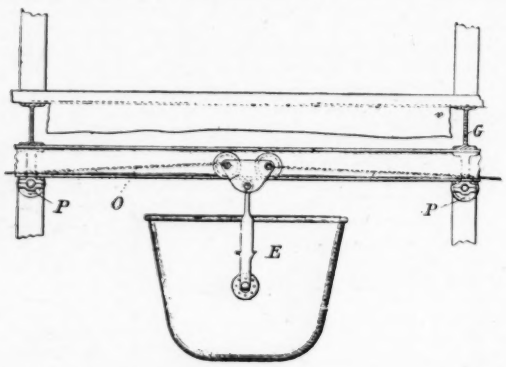
Collecting and Carrying Coke from Gas-Retorts.—Gibbons, W. P. & B. A., of Lower Gornal. No. 4760; Feb. 25; 1902.

This invention has reference to apparatus for the collecting and carrying out of coke from stage retort-houses—in which the coke, as drawn from the retorts, usually falls through an aperture between the retort-benches and the stage into barrows or trucks on to the ground floor. The patentees provide an elevated girder or rail track, which is, by preference, fixed to the underside of the girders of the stage. On the track are wheeled carriages, to which buckets for the coke are fixed at such a distance from the retort-bench, and at such a height, that the coke falls from the retorts into the coke-bucket; being guided thereto by side deflecting plates, and (if necessary) by back-and-front deflecting plates.

The illustrations (p. 702) show a front elevation of the apparatus, and a front elevation, on a larger scale, of a part of one of the rail tracks, and one of the suspended coke-buckets; also a sectional side elevation showing two of the retorts and the retort-house staging, and some of the deflecting plates for guiding the coke from the retorts into the suspended buckets.



The girder or rail track is a double girder track, on the bottom flanges of which travel wheel carriages, from which are suspended by hangers the coke-buckets or receptacles E. The double rail track is carried underneath the stage F and fixed to the underside of the



girders G, which carry the floor of the stage; so that the wheeled carriages, with the suspended buckets, can be traversed along the rail track from end to end. The girder or rail track runs along parallel with the front of the retort-benches, and is carried by framing I to the place J, where the coke is to be discharged. The framing I can conveniently be formed of uprights and cross-girders braced together by diagonal bracings, as will readily be understood; the girder tracks being bolted to the underside of the cross-girders.

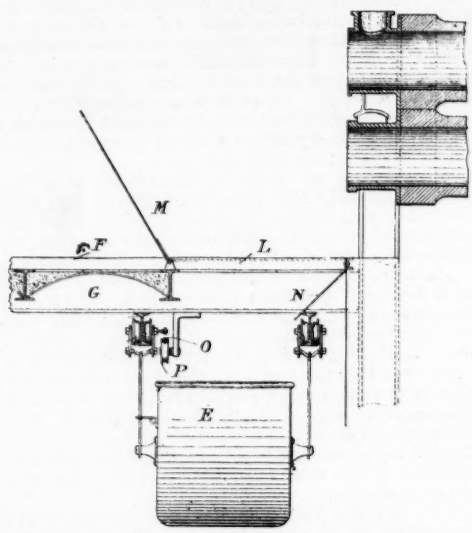
The coke receptacle E is arranged some little distance in front of the retorts; and in the staging F there is an opening L through which the coke falls into the receptacle; and this opening can be closed by a hinged door M. Below the opening L, there is an inclined deflecting plate N, to guide the coke as it falls into the bucket and prevent it falling on the carriage and girder track. The door M also assists in guiding the falling coke at the front.

As the coke is drawn from the retorts, it falls through the opening L into the bucket E, which is (by preference) made of such a capacity as to hold at least the charge of one retort. When the retort has been discharged, and the bucket has been loaded with the coke, the carriage is moved along the track to the outside of the retort-house by (say) a wire rope arrangement. This consists of a wire rope O, one end of which is connected to the carriage, and the rope is carried over guide pulleys P to the driving gear, and over guide pulleys at the top of the end of the framing I and round another guide pulley at the bottom; then on along and over guide pulleys, back along the front of the retort-house, and up over guide pulleys and along over guide pulleys P, and again connected to the carriage. So that the wire rope (having both ends connected to the carriage) is practically endless. Motion is transmitted to the wire rope by any convenient means—such (for instance) as by a gas-engine, the crank-shaft K of which drives on to the countershaft S, and motion is transmitted therefrom to the countershaft T, on which the rope pulley Q is fixed by ordinary open and cross bands with shifting gear, so that by shifting the bands the countershaft T and the wire rope O can be caused to move in one or other direction to move the carriage and coke-bucket either to or from the retort-house.

After the coke-bucket has been filled with the coke, the wire rope is caused to travel in the direction indicated by the arrow, carrying along the carriage with the suspended bucket and the coke from the retort-house up the inclined part of the track, and on to the higher level of same, and along to the farther part J, where the coke is required to be deposited. Then, after the bucket has been tipped, the rotation of the countershaft T is reversed, so that the endless wire rope O moves in the opposite direction, carrying the carriage and suspended coke-bucket back to the retort-house to be again filled; the movement of the wire rope being stopped when desired by bringing the straps on loose pulleys.

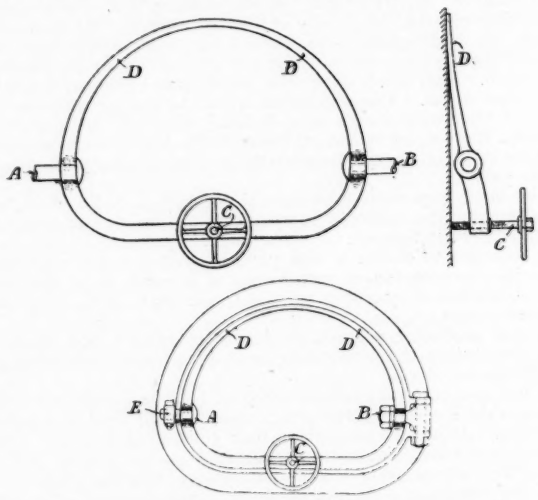
Controlling the Supply of Gas to Cooking-Stoves, &c.—Hygienic Stove Company and Greenway, E. P., of Liverpool. No. 6240; March 14, 1902.

This invention relates to means for controlling or limiting the supply of gas to gas cooking-stoves, and for like purposes, and for locking the parts in position when adjusted by means of an adjusting screw working through a screw-threaded opening in a snug on the tap body or casing, and adapted to be set to engage a projection on the tap barrel at any point within the fully closed and open positions The screw has a flange or disc on it, provided radially with recesses in its periphery or with the openings adapted to receive a locking-pin passed through an opening in the snug on the body of the tap.



Closing Retort Mouthpieces.—Timmis, G. H., of Stourbridge. No. 6470; March 17, 1902.

This invention has reference to securing and fastening retort-lid doors so as to make a tight joint. In order to do this, another frame or cradle is made, of any suitable shape, strength, and material. At A and B there are shown two pins, the outer ends of which drop into notches in two lugs on the frame at the end of the retort; while at C there is a screw. When the cradle is fitted in position—of course, after the door



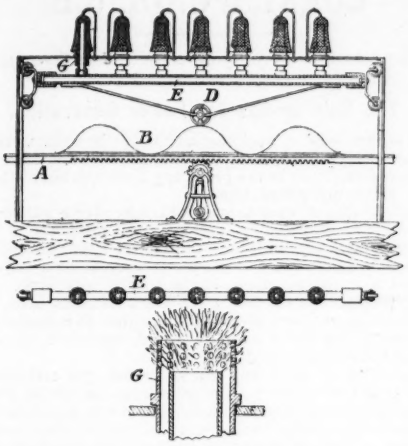
is in place—the screw-handle is rotated, and the end of the screw presses downwards against the lower edge of the door; and at the same time the top D or thin part of the cradle presses against the top edge of the door.

Instead of the cradle being placed in position by the pins or bolts A B, it may be hinged to the retort-frame at any suitable point, as shown in the lower elevation; and the other side of the cradle may be held by a link swung over it or by a latch or catch E.

Burning-off Mantles.—Fritz, F., of Clifton Street, E.C. No. 8368; April 10, 1902.

This apparatus (p. 703) consists of a supporting rail A, provided with cam surfaces B and adapted to be slowly reciprocated to and fro by means of rack and pinion gearing. Upon the shaped contact surface rests a wheel D, which supports a tube E working in guide rails, and upon this tube are arranged sockets G the ends of which are provided with perforations or holes, so as to permit the mantles hanging over them being hardened at their lower extremities. These sockets fit or come over the burning-off burners.

The operation is as follows: As soon as the rail A is displaced, the wheel rotates upon the cam surfaces, and thus causes the tube E, with its burning-off burners, to ascend and descend, or the sockets G and mantle holders to effect the same movements. In this manner (says



the patentee), uniform and certain burning-off is effected, and hundreds of mantles may be burned-off in one operation without any difficulty—irrespective of the skill of the operative, of the material of which the mantles consist, and of the number under treatment.

Lighting Devices for Incandescent Gas-Burners.—Keith, J. & G., of Farringdon Avenue, E.C. No. 11,644; May 22, 1902.

This invention relates to devices for lighting incandescent gas-burners by means of an electric spark through the intervention of a bye-pass pilot light, and has for its object "to so construct and arrange the top bye-pass and relative devices that the bye-pass is automatically cut off on the burner being lit, so that a saving of gas is effected, and risk of fire due to the pilot light being left burning is avoided."

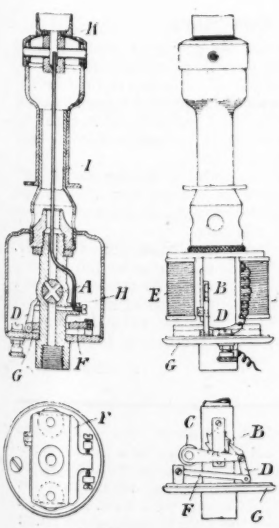
[The arrangement was described and illustrated in the "JOURNAL" for Dec. 30 last, p. 1749.]

Inverted Incandescent Gas-Burners.—Bachner, A., of Frankfort-on-the-Main. No. 26,955; Dec. 6, 1902.

There have (says the patentee) been many attempts to construct incandescent gas-burners which have the appearance of burning downwards; but they have "always been a failure, because the downward stream of mixed gas and air has hitherto been unable to entirely envelope the mantle and render the whole of it incandescent." The present invention relates to a lamp in which this failing is removed, by arranging a baffle surface inside the mantle, opposite the discharging end of the mixing-tube, by which means the mixture of gas and air is directed against the sides of the mantle when incandescent.

Self-Lighting Gas-Burners.—Stierli, F., of Zürich. No. 28,493; Dec. 24, 1902.

This invention relates to self-lighting gas-burners operated from a distance, and has for its object to provide means by which the opening and closing of the gas-tap are effected through the action of an electro-magnet, and the gas issuing from the burner is lit by a flame from a bye-pass.



The plug A of the gas-tap for the burner is formed with two ports, which cross each other at a right angle. To the plug is fixed (outside the gas supply-tube) a ratchet-wheel B, having eight teeth in which engages, through the influence of a weight C, the pawl D. This pawl is pivoted to the plate-like armature F of the electro-magnet E, and the latter to the base-plate G. The plate carries a bell-shaped cover which protects the electro-magnet.

When the magnet is not excited, the weight of the armature keeps it away from the magnet; and the pawl being kept in gear with the teeth of the ratchet-wheel by a weight, springs are entirely dispensed with.

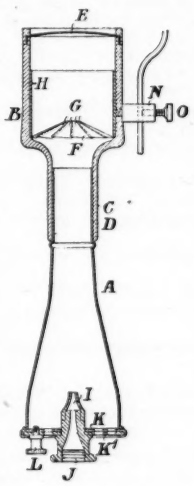
The gas supply-tube below the tap is formed with a channel H, with which communicates a thin pipe I forming the bye-pass leading from the outside to the inside of the gas supply-tube, centrally up into the burner and into a passage K, which latter is cut off from the draught of the burner.

In connection with the passage, however, pipes are arranged which bring them into communication with the air outside the burner, and which at their outer ends are furnished with fine wire gauze. Above the perforated top of the gas-burner, there is a cup the bottom of which has apertures, and to the centre of which reaches the passage K. The gas for the bye-pass flame being thus through the pipes supplied with air separately from the burner, the bye-pass flame is converted into a bunsen flame, and the draught created in the burner when opening the tap cannot extinguish it. The cup serves to prevent the bye-pass flame being extinguished through being beaten back or flickering when extinguishing the main flame.

The gas-tap is opened by exciting the electro-magnet, which attracts the armature and causes the pawl D to turn the ratchet-wheel B one tooth, and thereby open the tap. The electro-magnet, thus excited, first opens the gas-tap; and the current being afterwards interrupted, the armature with its pawl drops to its normal position, while when the electro-magnet is excited a second time the gas-tap is turned a further one-eighth of a revolution, and cuts off the supply to the burner.

High-Pressure Gas Lighting.—Onslow, A. W., of the Royal Arsenal, Woolwich. No. 28,695; Dec. 29, 1902.

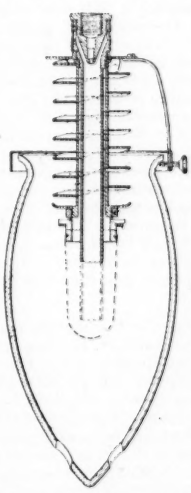
This invention relates to burners for incandescent gas lighting at high (or comparatively high) pressure; the object being "to provide means whereby the air inlet area can be adjusted to suit the supply of gas, and the gas can be thoroughly mixed and can have imparted to it a rotating movement, and also means for causing the flame to impinge on the mantle, and thereby develop a high illuminating power."



A is the body of the burner, and B the cap or head having a lower tubular portion C, which fits over the turned joint D, so as to prevent the escape of gas and also enable the burner D to be easily removed when desired. E is an iron gauze cap fitted at the upper end to the burner-head, and serving for breaking up the gas and causing it to impinge on the mantle, and also for preventing lighting-back. F is a distributing device, which serves for rotating the gas and air flowing into the burner-head, and thus thoroughly mix it. This device comprises a number of inclined blades G, which radiate downwards from the centre—spaces being left between the overlapping of the plates for the passage of the gas. The distributor is kept in position by a thin tube or lining H, which fits inside the burner-head. I is the inlet nozzle for the gas (of ordinary construction), which is provided with the usual screw socket J for fixing the burner to a gas-pipe. K K^1 are two plates, through the centre of which the nozzle I passes, and which are mounted in the lower end of the burner body. These two plates are provided with a number of air inlet perforations or holes opposite one another, so that by shifting the upper plate K (which is rotatable) the total area of the air inlet can be varied to suit the supply of gas.

Inverted Incandescent Gas-Burners.—Farkas, A., of Paris. No. 265; Jan. 5, 1903.

This invention relates to an incandescent gas-burner adapted to burn downwards, in which the overheating of the mixing-tube and other parts of the lamp by the heated gases of combustion is prevented by surrounding the bunsen tube with another tube, so that a layer of air, adapted to insulate heat, is placed between the bunsen tube and the outer tube on which the gases of combustion impinge. This outer tube can be provided with ribs adapted to conduct heat outwards.



One form of this invention is shown. The burner is a bunsen burner of the usual construction, except that the gas-nozzle is at the upper part of the burner and the mixing-tube is directed downwardly. The air-inlet apertures are at the sides, as usual; and the mixing-chamber is surrounded by a ring provided with air-apertures corresponding with those in the burner, so that the supply of air can be controlled by adjusting the ring. The aperture of the bunsen burner can either be situated at the upper end of the incandescence body or can be a considerable distance within the latter, as indicated in the drawing by dotted lines. In the latter case, "the flame more thoroughly impinges on the incandescence body; and in the former case an incandescence body of special shape must be used."

The mixing-tube of the burner is surrounded by a jacket which is screwed to the burner. By this means, an annular chamber is formed between the tube and the jacket, and the chamber only communicates with the outer air at its lower end. In order to allow from the first as little heat as possible to be transmitted from the gases of combustion to the mixing-tube, the jacket is preferably provided (in large burners) with ribs of large surface area, of any suitable shape, and arranged in any suitable manner; but "they must be good conductors of heat and have sufficient surface area to allow of rapid transmission of heat." The drawing represents a helical metal strip surrounding the jacket. Below the heating ribs the jacket is provided with a disc and a socket—the latter furnished with claws for holding the ring supporting the incandescence body.

The purpose of the arrangement described is obvious. The heat generated by combustion is first transmitted to the disc and ribs; and owing to the large superficial area of these parts, the heat which is not directly transmitted to the outer air is stored up in the parts without being

transmitted to the burner itself. The direct transmission of heat from the gases of consumption to the burner "is also very effectually prevented by the air enclosure in the chamber—this air is, of course, considerably rarefied by being heated, and forms an excellent heat insulator."

APPLICATIONS FOR LETTERS PATENT.

4936.—DREW, W. T., "Prepayment gas-meters." March 3.
4947.—MELHUISH, A. G., "Internal combustion engines." March 3.
4963.—THOMPSON, W. P., "Automatic gas regulating valves." A communication from the Holley Heat Regulator Company. March 3.
4982.—TULLY, C. B., "Manufacture of gas." March 3.
4988.—MOOR, C. G., "Treatment of gas liquor." March 4.
5005.—COTTON, G., "Gas and like pipe unions." March 4.
5051.—HILL, E. J. N., "Reflectors for incandescent gas-lamps." March 4.
5060.—JOHNSON, J. Y., "Lighting and extinguishing gas-burners." A communication from F. Siemens. March 4.
5080.—D'HEUREUSE, R., "Incandescent mantle." March 4.
5088.—LAKE, H. H., "Producing a mixture of gases or of gas and air for illuminating purposes." A communication from the Selas Gesellschaft m. b. H. March 4.
5092.—THE ELECTRIC AND ORDNANCE ACCESSORIES COMPANY, LTD., and ARON, L. J., "Indicating devices for electricity and gas meters." March 5.
5116.—DUTTON, W., "Cocks for steam, gas, or water." March 5.
5156.—GILL, F. E., "Bath geysers." March 5.
5168.—SHAW, E. J., "Adjustable pendants for hanging lamps." March 5.
5190.—JOHNSON, A., and MANSERGH, W., "Gas-meters." March 5.
5215.—BRAY, J. W., "Incandescent gas-burners." March 6.
5254.—WITTMER, G. X., "Recording apparatus for meters." March 6.
5301.—THIEM, E. A. P., "Lighting and extinguishing gas-burners." March 6.
5374.—CUTLER, S., Jun., "Conveyors for hot coke." March 7.
5380-1.—NEW, A. G., "Internal combustion engines." March 7.

Sale of Gas-Works.—The Hatherleigh (North Devon) Gas-Works have just been sold for £300. The cost of the undertaking at the outset was £3600.

Gorleston and Southtown Gas Bill.—A Sub-Committee appointed by the Parliamentary and Legal Committee of the Yarmouth Town Council have reported a conference with the promoters of the Gorleston and Southtown Gas Bill, as a result of which they had agreed to alterations, modifications, and additions, more particularly in clauses 5 and 8, which would have given the Company power to erect gas-holders and store gas on any land, wherever situated, which they might in future agree to purchase. These clauses are to be modified so as to render the power conditional on the consent of the Corporation or the Board of Trade. By the existing Act, the maximum price of gas is 6s. per 1000 cubic feet. This is to be modified so as to bring it down to 4s. 7d. With regard to gas for public lighting, the Sub-Committee secured a further discount of 2½ per cent. (making 17½ per cent. in all) upon the amount paid by the Corporation. The report was adopted. The Corporation are being advised by Mr. W. A. Valon.

Plymouth Corporation and the Gas Company's Bill.—It was reported at a meeting of the Plymouth Town Council last Tuesday, that the Special Purposes Committee of the Corporation were in negotiation with the Gas Company with reference to the Bill the latter are promoting. Mr. Crowle pointed out that, among other things, the Bill asked sanction to a reduction in the illuminating power of the gas; and he said it would be most unfortunate if this were done. Gas was cheap in Plymouth, but it was not in the interest of the consumers that its quality should be lowered. The Town Clerk (Mr. J. H. Ellis) said that everything was being done by the Committee, under competent and disinterested advice, to safeguard the interests of the consumers and the public. The gentleman whom they had consulted had been asked to advise them in the best interest of consumers. The matter was being amicably discussed with the Gas Company; and there were indications that a satisfactory settlement would be arrived at. The question of illuminating power was one for experts; and they had an independent and well-qualified one.

Gas-Works Extensions at Spalding.—A Local Government Board inquiry has lately been held at Spalding, by Colonel W. R. Slacke, relative to an application by the Urban District Council for a Provisional Order to enable them to borrow money for the purpose of extensions to the gas-works. The works were originally acquired by the Spalding Improvement Commissioners (the Council's predecessors) at a cost of about £14,000; and some £12,000 more has been expended in enlargements and improvements. The whole of the latter sum has been paid out of profits, except an overdraft on the bank now standing at £1295. The sum paid for interest on this overdraft was surcharged; and though the surcharges were subsequently remitted, the Local Government Board pointed out that the practice could not be continued. Hence the application for a Provisional Order. The Gas Manager (Mr. J. G. Hawkins) stated that the price of gas was 3s. 4d. per 1000 cubic feet, less a discount of 10d. for payment within a month—thus reducing the charge to 2s. 6d. net. For street lighting, there was a rate of 6d. in the pound, which was credited to the gas-works; but this was by no means a full payment, the object being to keep the rate low. There were about 240 prepayment meters in use, and orders in hand for nearly 300 more. The maximum amount of gas made at the works in 24 hours had been 264,000 cubic feet; and it was proposed to make provision for an output of 500,000 feet. New trunk mains and considerable extensions in various parts of the town were also contemplated.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Sale of Gas for Power Generation.

SIR,—It is somewhat of a coincidence that when this week's number of the "JOURNAL," containing the leader on "The Sale of Gas for Power Generation," was in the press, my Directors should be adopting the line of policy advocated therein.

The question was, at what rate should they give a supply of gas for use by a couple of gas-engines—one of 30 and the other of 20 nominal horse power, with a probable consumption of 2 million cubic feet per annum. Our ordinary price is 3s. per 1000 cubic feet. My Directors have offered a supply for these engines at 2s. per 1000, with a discount of 2½ per cent. on the first 2 million cubic feet used, and a further discount of 2½ per cent. for any consumption in excess of 2 millions. The net price of the first 2 millions would, therefore, be 22·80d. per 1000, and of the excess 21·60d. per 1000.

As the net cost to us of our gas is 22·66d. per 1000 feet sold, we shall apparently—to quote your own words—be selling the gas "for the pleasure of turning over the money." We do not, however, expect that the gas for this supply will cost us 22·66d. to make and deliver to the consumer. The cost under the head of "manufacture"—*i.e.*, into holder—is 13·57d.; and if there be added to that 2·43d. for distribution, &c., we arrive at 16d. as the cost for such a supply—leaving a margin of profit of about 6d. per 1000 cubic feet.

The demand will be nearly entirely a day one; and taken altogether it promises to be advantageous to the Company and to some extent profitable. The engines are at present worked with producer gas. Electricity is not yet with us; but it is coming. We expect shortly to be in the throes of competition with it; and possibly the suppliers—with that keenness to do business upon which you comment so forcibly in the article referred to—might have snapped up this bit of "day load."

HENRY TOBEY.

Malton, Yorks., March 13, 1903.

SIR,—I am very interested in the article on the above subject contained in the "JOURNAL" for the 10th inst.

The Council here are selling electricity at 1d. per unit, which is calculated to work out at 0·9d. per indicated horse power per hour with small motors, and 0·8d. with large motors, and which is equal to gas at 3s. 9d. and 3s. 4d. per 1000 cubic feet respectively. We sell gas for engines at 2s. 6d. per 1000 cubic feet; and yet motors continue to be fixed.

Your advice, I understand, is to sell gas at 1s. 6d., or any other figure that will retain and obtain gas-engine consumers. Your objective point cannot be questioned; but before recommending my Directors to adopt the course to attain it that you so courageously champion, I (doubtless there are some others in the Midland district if not in the Metropolis) am anxious to understand at least a few of the principles or the bases on which your proposition is founded. My ideas—it must be admitted—of commercial transactions do not at present allow me to follow your argument. Doubtless you are right, although if you had not written as you have done, I should have been much disposed to argue that the transference of money from one pocket to the other simply meant the wearing out of the "fabric" and the ultimate necessity of applying to the tailor for patching materials or a new outfit. Surely you do not mean to suggest that gas should be sold at cost price!

Seriously, I am much perturbed, and shall remain so until you enable me to see through your glasses, and follow the rationality of your discourse on so important a subject.

GEO. HELPS.

Nuneaton, March 14, 1903.

Suggested New Gas-Stove.

SIR,—I beg to thank Mr. Sherburn for his notice of my suggestion for a new stove in his valuable letter in your issue of the 10th inst.

It appears to me that the prospect of gas as "the fuel of the future" is largely dependent upon the development of improved types of stoves, and that makers and companies alike would be well advised in carefully considering every proposal to advance them in public favour, and secure their recognition as superiors to coal-grates.

A good "cooker," properly used, is a splendid (if not the best) advertisement for gas-cooking; but a bad stove, or a consumer uninformed as to the proper methods of use, is calculated to damage the good fame of gas. Hence my advocacy of "lady advisers."

As regards economical working, and in connection with Mr. Fletcher's opinion that the ball-fire is far too expensive for the working classes, I have lately been wondering that there is no stove (as far as I know), either for heating or cooking, in which the gas or air is warmed before being burnt, so as to secure greater calorific value for the gas. The principle is being very largely applied in the case of burners; why not in stoves?

A. CLEVERLY.

182, *Brecknock Road, N., March* 13, 1903.

The Quality of Gosport Water.—The agitation over the alleged impurity of the water at Gosport does not abate; and at a public meeting held last Wednesday, Inspector-General Reid asserted that people were being driven from the town. He said he was afraid that the works now being carried out at the Company's well would not be a success, for he thought they would never be able to prevent pollution of the water; and the greatest boon for the 30,000 inhabitants would be an arrangement to have the water from Portsmouth, which borough stood in regard to its water supply second to none in the country. These remarks were endorsed by other speakers; and it was resolved to appeal to the Local Government Board to order an inquiry on the subject, and to ask the aid of the War Office and the Admiralty.

The Granton Works of the Edinburgh

The 1000 Tons per Day Inclined Retort Carbonizing Plant.—D

Cross Stays, with Detail of Reg

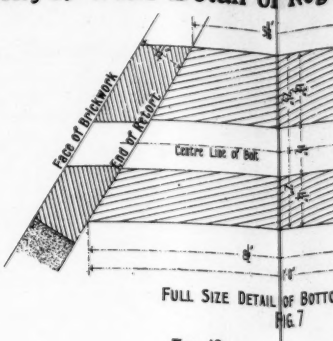


FIG. 7

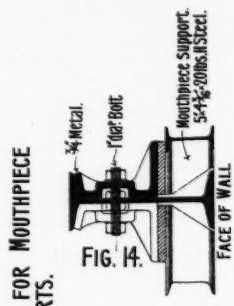


FIG. 14.

DETAIL OF BRACKETS FOR MOUTHPIECE SUPPORTS.

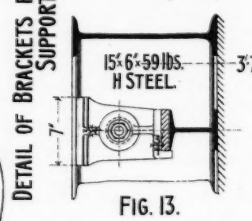


FIG. 13.

FIG. 12.

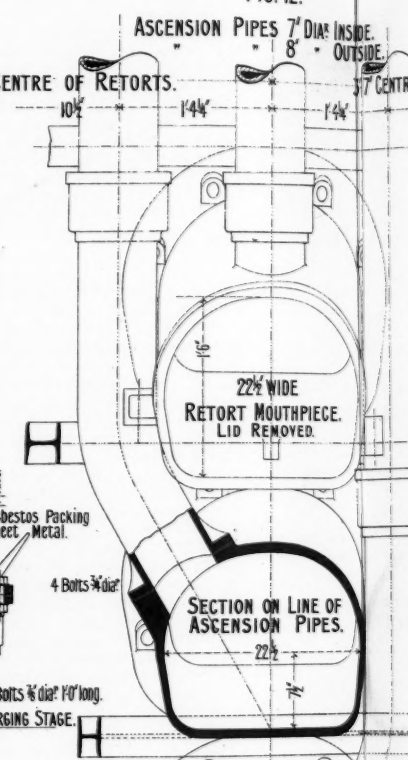

ASCENSION PIPES 7" DIAM. INSIDE.
" 8" " OUTSIDE.
3'7" CENTRE OF RETORTS.
22½ WIDE RETORT MOUTHPIECE. LID REMOVED.
SECTION ON LINE OF ASCENSION PIPES.

FIG. 9.

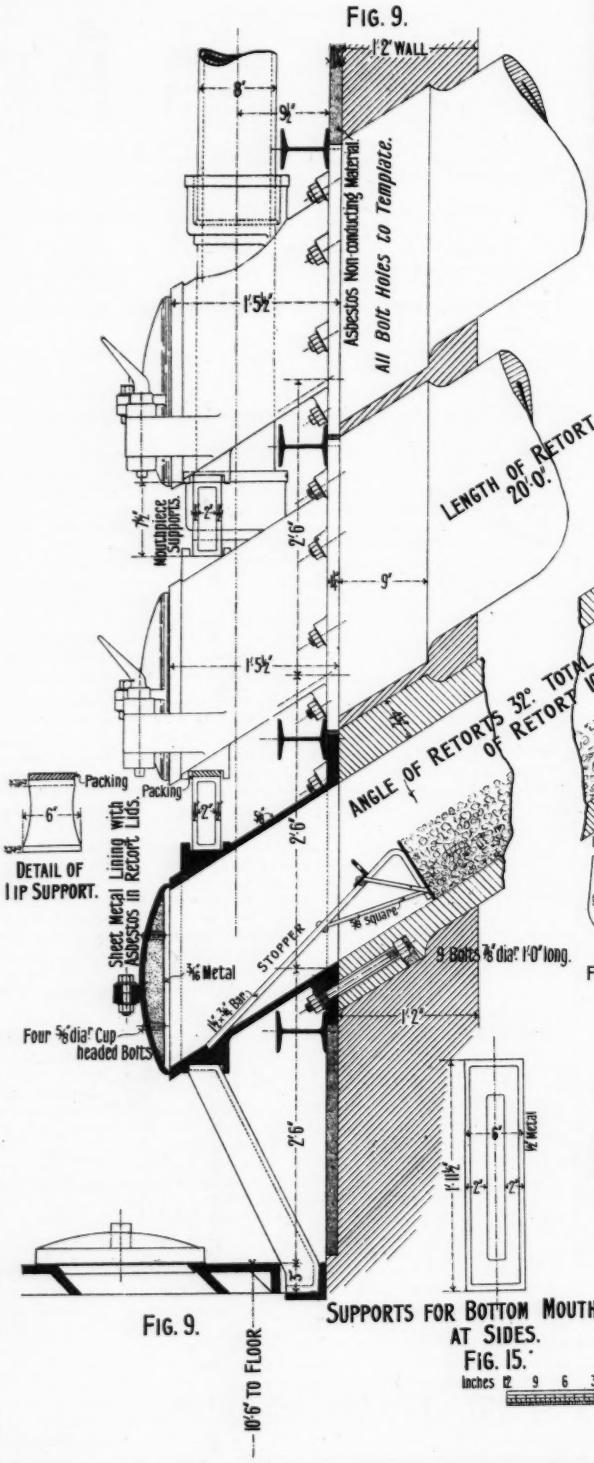

1'2" WALL
Asbestos Non conducting Material
All Bolt Holes to Template.
LENGTH OF RETORT 20'0"
Mouthpiece Supports.
ANGLE OF RETORTS 32° TOTAL RISE IN LENGTH OF RETORT 10'7¾"
Packing
Packing
DETAIL OF LIP SUPPORT.
Sheet Metal Lining with Asbestos in Retort Lids.
STOPPER
¾ Metal
Four ⅝" dia.r Cup headed Bolts
9 Bolts ⅞" dia.r 1'0" long.
10'6" TO FLOOR

FIG. 9.

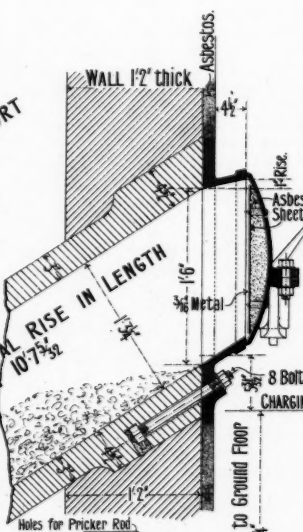


FIG. 10.
FRONT ELEVATION OF STOPPER.

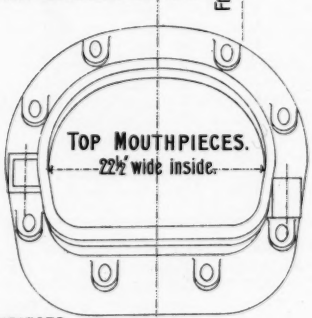
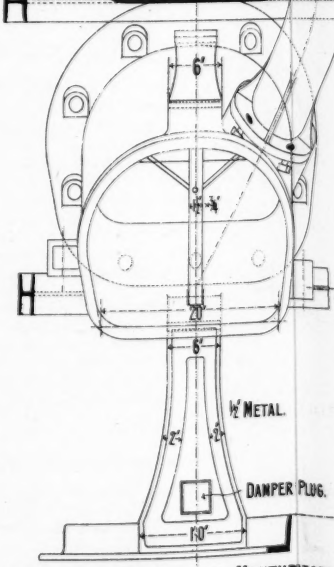


FIG. 11.



SUPPORTS FOR BOTTOM MOUTHPIECES IN CENTRE.
FIG. 12.

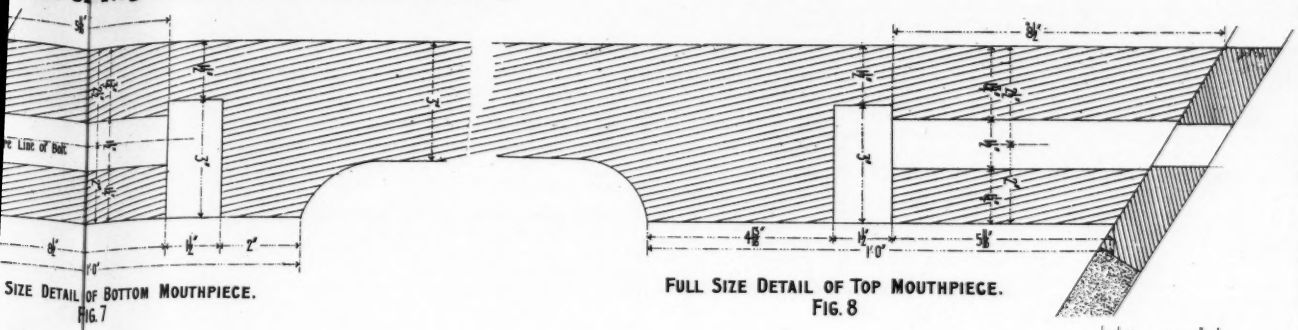
SUPPORTS FOR BOTTOM MOUTHPIECES AT SIDES.
FIG. 15.

Copyright at Stationers' Hall.

nburgh and Leith Gas Commissioners.

ng Plant.–Details of Retort Settings, Mouthpiece Support and etail of Regenerative Chambers.

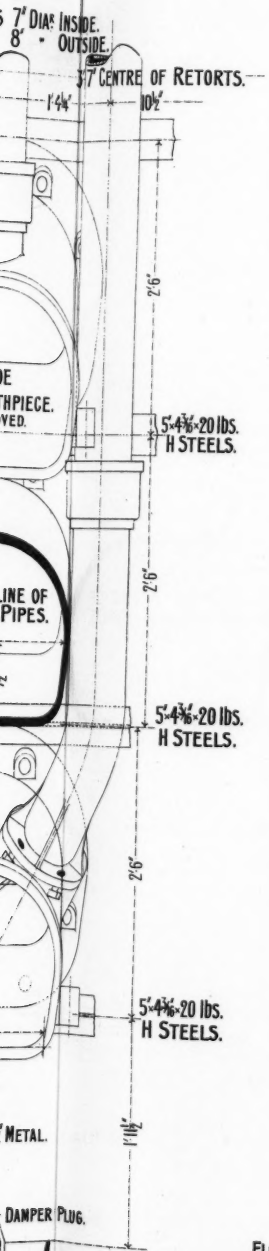
No. 12.



FULL SIZE DETAIL OF BOTTOM MOUTHPIECE.
FIG. 7

FULL SIZE DETAIL OF TOP MOUTHPIECE.
FIG. 8

. 12.



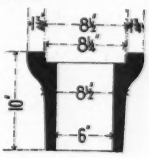


FIG. 2.

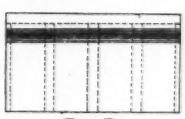


FIG. 3.

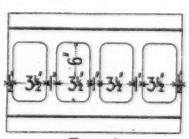


FIG. 4.

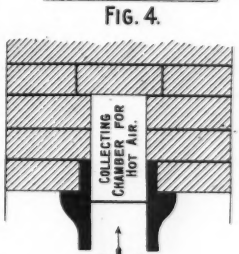
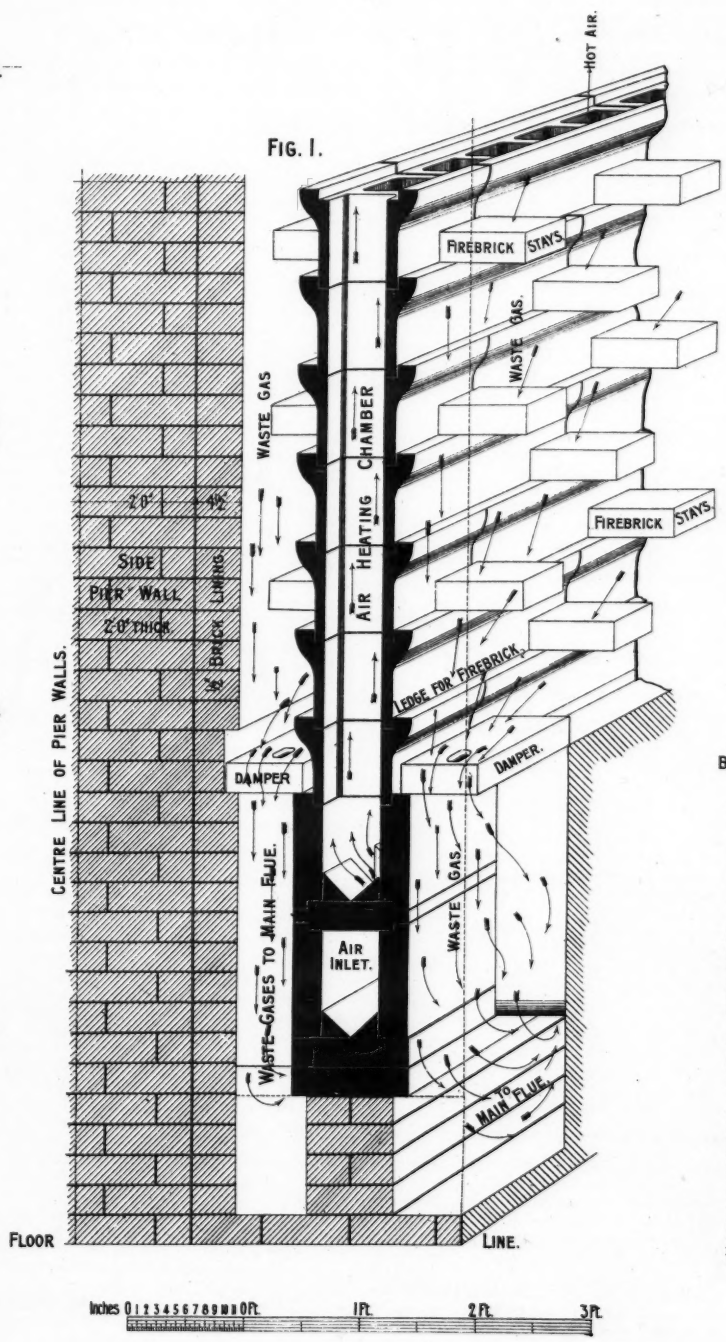


FIG. 5.

FIG. 1.



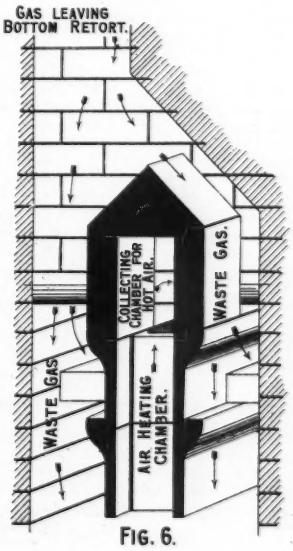


FIG. 6.

Inches 0 1 2 3 4 5 6 7 8 9 10 11 0Ft. 1Ft. 2Ft. 3Ft.

WALTER RALPH HERRING,
M.INST.C.E., *ENGINEER.*

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time: Birmingham Corporation Bill, Bradford Corporation Bill, Harrow and Stanmore Gas Bill.

The British Gaslight Company (Norwich) Bill, Chard Corporation Gas and Electricity Bill, Hexham Gas Bill, Nantwich Gas Bill, and Plymouth and Stonehouse Gas Bill have been referred to a Select Committee, consisting of the Earl of Dartrey (Chairman), the Earl of Northesk, Lord Saltoun, Lord Lilford, and Lord Carew; to meet next Thursday

Petitions have been presented against the following Bills:—

Belfast Water Bill, Birmingham Corporation Bill, Bradford Corporation Bill, British Gaslight Company (Norwich) Bill, Bury and District Joint Water Board Bill, Chard Corporation Gas and Electricity Bill, Nantwich Gas Bill, North-Western Electricity and Power Gas Bill, Oldham Corporation Bill, Rickmansworth Gas Bill, Scunthorpe Urban District Water Bill, Torquay Corporation Water Bill, Wellington (Salop) Gas Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Bridgwater Gas Bill, Broadstairs Gas Bill, Commercial Gas Bill, Crystal Palace District Gas Bill, East Ardsley Gas Bill, Gorleston and Southtown Gas Bill, Hampton Court Gas Bill, Ipswich Gas Bill, Maidstone Gas Bill, Market Drayton Gas Bill, North Middlesex Gas Bill, Scarborough Gas Bill, Sittingbourne District Gas Bill, Sutton District Water Bill, Walker and Wallsend Union Gas Bill, Winchester Water and Gas Bill.

Petitions have been presented against the following Bills:—

Bath Corporation Water Bill, Bridgwater Gas Bill, Crystal Palace District Gas Bill, Ebbw Vale Water and Improvement Bill, Gaslight and Coke Company Bill, Hampton Court Gas Bill, Ipswich Gas Bill, Leigh Corporation Bill, London County Council (General Powers) Bill, Merthyr Tydfil Urban District Council Bill, Nantyglo and Blaina Water Bill, North Middlesex Gas Bill, Sutton District Water Bill, Walker and Wallsend Union Gas Bill.

In order that members may know as long as possible beforehand when opposed private business is likely to be proceeded with at evening sittings of the House, the Clerk to the Chairman of Ways and Means (Mr. West) has arranged with the Private Bill officials that a full *agenda* for the ensuing week shall be issued with the "Votes and Proceedings" every Saturday morning. This was done for the first time last Saturday, when it was announced that the Gaslight and Coke Company's Acts Amendment Bill, the Gaslight and Coke Company Bill, and the London County Council (General Powers) Bill would be taken this evening, and the West Sussex Water Bill on Thursday.

LEGAL INTELLIGENCE.

SHOREDITCH COUNTY COURT—Friday, March 13.

(*Before His Honour Judge* SMYLY, K.C.)

Clark v. The Gaslight and Coke Company.

In this case, which has been frequently before the Court, the applicant asked that an order made by Judge French on April 1, 1901, under the Workmen's Compensation Act, might be varied by directing a payment of £1 instead of 14s. 9d. per week.

Mr. W. M. THOMPSON appeared for the applicant; Mr. A. NEILSON represented the Company.

Applicant, while he was employed as a coal porter by the defendants, at a salary of £2 1s. 9d. per week, met on Dec. 16, 1899, with an accident, causing serious injury to the fingers of his left hand; and, by agreement with the Company, he received as compensation £1 per week. On April 1, 1901, the order was varied by Judge French, by the weekly compensation of £1 being reduced to 14s. 9d.; the applicant entering the service of the Company as a gatekeeper at 27s. per week, *plus* the 14s. 9d. This arrangement lasted from April 10, 1901, until Nov. 22, 1902, when he was discharged for disobedience to the reasonable orders of the Company's Engineer. On the question of the wrongful dismissal coming before the Court on Jan. 30, (*ante*, p. 293), the Jury decided that the man was rightly and properly dismissed. His wages having ceased with his dismissal, it was asked that the order might be varied by directing that the sum of £1 per week originally agreed upon should be paid to him.

Applicant deposed that his hand was in the same condition as on April 1, 1901, and that he was unable to procure other employment, as he was totally unfitted for the work either of a sailor or a coal porter, which were the only occupations of which he had any experience. The work he had to do while acting as gatekeeper for the Company was to sit in a box and read a newspaper.

Dr. *Boyd*, L.R.C.P., deposed that he had examined the applicant, and found that, though his general health was good, he was unable to work either as a sailor or a coal porter, the two centre fingers of the left hand not being flexible enough to enable him to grip a shovel.

Mr. THOMPSON having referred to the case of *Ellis v. Knott*, tried before Judge Smyly at Derby in 1900, submitted that he was entitled—the circumstances not having varied, and the man being unable to work—to have the original amount restored.

Dr. *Hastings*, the Company's Consulting Physician, agreed that the man was incapable of doing the class of work referred to, but said that the hand might be educated to do some kind of work, and that it was in better condition now than it was on April 1, 1901, as he had noticed that the applicant, while giving his evidence, had held his hat in his hand with the very fingers alluded to. He had still a useful forefinger and thumb.

Mr. *Iago*, the Company's Chief Engineer at Beckton, said the applicant's duties did not consist merely of sitting in a box and reading a newspaper. He had to see that no unauthorized persons entered the works; the wages of 27s. per week being the fair market value for this class of work, and not an eleemosynary payment.

Mr. NEILSON submitted that the man's wage-earning capacity was the same as it had been from April 10, 1901, to Nov. 22, 1902, when the Company were paying him 27s. per week, which he might still be receiving but for his own misconduct. He then addressed to the Court a long legal argument as to whether such an application as the present could be made under section 12 of the Workmen's Compensation Act. He submitted that the applicant had, by his own misconduct, forfeited his position, by disobeying reasonable orders; but his present wage-earning capacity was admitted by himself to be the same as it was between the dates when he was receiving his 27s. a week, although, having been discharged from that employment, it might be difficult to procure other work of the same easy character. The defendants ought not to be asked to pay for his stupidity, carelessness, and folly. The case of *Irons v. Davis and Timmins*, and several others, were cited.

Mr. THOMPSON, in reply, relied upon the case of *Great Northern of Scotland Railway Company* (38 Scotch Law Reports, 683), in which it was decided that "the offer of employment may be some evidence of a man's earning capacity, but it is not so in every case." If it were offered as an eleemosynary or charitable matter, or from some understanding or arrangement, it was not conclusive. He submitted that in this case the workmen entered the employment of the Company by virtue of an arrangement whereby the compensation payment was reduced. Giving the man the job of gatekeeper was a pecuniary advantage to the Company, who would, in any event, have had to pay someone to do the work.

It was agreed between Counsel that, in order to ascertain whether the matter was one of arrangement or not, the shorthand notes of the proceedings before Judge French on April 1, 1901, should be put in evidence.

Judge SMYLY said that as the bodily condition of the applicant had not altered since he started working as a gatekeeper for wages, and not by way of receiving a gratuity, and as he had lost his 27s. per week through disobeying orders, the fact that it was difficult to find other employment was not sufficient to justify the alteration of the award of 14s. 9d. per week.

Mr. NEILSON asked that, this being a Trade Union case, the costs should be on Scale C.

Judge SMYLY: I think you are entitled to it. It is the gravity of the case that determines the scale.

Deficient Illuminating Power at Portsmouth.

The Portsea Island Gas Company were last week sued by the Portsmouth Corporation for penalties for supplying, on Jan. 30 and 31 and Feb. 1, gas of less than 14-candle illuminating power. It was shown by the evidence of Mr. A. A. Moncreaff, the Borough Gas Examiner, that three tests of the gas were made each day between 5 p.m. and 10 p.m., with the result that the average was 13·59 candles on Jan. 30, 13·49 candles on Jan. 31, and 13·8 candles on Feb. 1. The charges were virtually admitted by the Company's Engineer (Mr. J. D. Ashworth), though he explained that on the first two days tests were made at the Company's offices, which were only about 100 yards from where the others were carried out; and the results were a little better than the official ones. On the third day, no tests were made; attention being confined to endeavouring to ascertain the cause of the defective light. The Company had had some accidents with their apparatus, and the fall of the illuminating power of the gas below the standard was simply one of the results; there being no intention whatever to defraud the consumers. The Company had found themselves unable to ensure the standard quality of gas on the days in question, as, by some means, the illuminating power had dropped, owing to the enormous increase of work and the excessive strain on the plant. The Bench imposed a fine of 60s. for the January offences, and one of 20s., and 9s. 6d. costs, for the one in February.

The Claim of the South Shields Corporation.—The amount claimed by the South Shields Corporation from the South Shields Gas Company in respect of the explosion of gas in Commercial Road on Jan. 11, 1902, was £270 14s. 8d., not £227 14s. 8d., as given in the "JOURNAL" last week (p. 643).

New Wells for Birkenhead.—In the matter of water supply, Birkenhead is coming to the end of its present resources; and at a special meeting of the Town Council last week, sanction was given to the expenditure of £50,000 on the sinking of two new wells and the provision of pumping-stations. This outlay, it is calculated, will ensure a supply of water for the next fifteen years; but it is proposed that the Special Sub-Committee of the Gas and Water Committee who have had the matter in hand shall meanwhile consider what steps should be taken to obtain a sufficient permanent future supply from new sources altogether outside Wirral. For some time past, the Corporation have been compelled to follow the water in the existing wells from one level to another; and it is feared that, situated as they are with the sea practically on three sides of them, if they went much deeper there might be danger of an inrush of sea water which would destroy the supply.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Ninety-Sixth Ordinary General Meeting of this Company was held on Monday, the 9th inst., under the presidency of Sir FREDERICK T. MAPPIN, Bart., M.P.

The GENERAL MANAGER and SECRETARY (Mr. Hanbury Thomas) having read the notice convening the meeting,

The CHAIRMAN moved the adoption of the report and accounts for the half year to Dec. 31, which were noticed in the "JOURNAL" for the 17th ult. (p. 423). He said the shareholders would find that the profit for the six months had been £55,484; and after the payment of a dividend amounting to £43,424, they had a balance left in hand of £12,060. This, added to the sum brought forward from the last account, would leave them a balance in hand for the present half year of £31,497. The reserve fund stood at £86,848, and was at its maximum. The large balance that they had after paying the dividend had enabled the Directors to make a reduction in price at the end of the present quarter of 2d. per 1000 cubic feet. The price would then be 1s. 10d., 1s. 8d., and 1s. 6d., according to consumption, and 1s. 6d. for gas-engines if the account for the year amounted to £9 3s. 4d. In July, 1900, in consequence of the great rise in the price of coal, the Company had to advance the price of gas by 4d. per 1000 cubic feet. Since that time, they had reduced it 2d.; and, as he had just said, a further 2d. would be taken off at the end of this month. Besides this, they had paid advances to the workmen in wages amounting to above £4000 a year; and a special reduction had been made in the price of gas supplied to gas-engines, resulting in a further reduction in the income of £2146 per year. A reduction had been made in the rental of the smaller-sized meters, and this meant £1089 less a year; and yet, after surrendering £7500 a year, they had been enabled to make a further concession in the price of gas. When this new reduction came into force, the charge for gas would be as low as the lowest price it had ever been supplied at in Sheffield. These results had been acquired somewhat in the following way: They had received £2829 more for coke, £5233 more for sulphate of ammonia, coals had cost £9524 less, wages £1836 less, and repairs to mains £1704 less. On the other side of the account, they had received £5093 less for gas, and repairs to works had cost £8126 more. The quality of the gas had been maintained fully; and the average of 1149 tests for the six months showed 17·43 candles, and the average of 2249 tests in twelve months 17·41 candles. They had carbonized 142,085 tons of coal during the half year; and the gas sold had amounted to 1,420,369,000 cubic feet, or a decrease of 0·01 per cent. as compared with the corresponding period of 1901. The leakage had been 3·56 per cent., as against 4·86 per cent. in the former year. The number of additional meters connected had been 3442 in the twelve months, and the total now fixed was 71,392; while there had been 1374 gas-fires sold and 963 boiler-fires, &c. Besides this, 276 additional cooking-stoves had been lent on hire, and 83 gas-engines had been fixed during the twelve months. The decrease of 1,422,000 cubic feet of gas was accounted for by the Company having sold double the quantity of incandescent burners during the period to what they had done in any former six months. He presumed their competitors in the trade had done about the same, and that the decrease was fully accounted for thereby. The old flat-flame burner consumed 5 feet of gas per hour; while the incandescent consumed only 3¾ feet and gave double the amount of light. [Mr. THOMAS: Four times the light.] Someone said four times; he was satisfied to say double the amount, knowing then that he was underestimating it. The Company made contracts with those who would pay for it; and 24 men were employed to keep in order the incandescent burners of those who contracted with them. These men looked after the burners, mantles, and globes. Persons who had only six burners paid 4d. per burner per month; those having more than six paid 3d. per burner per month. They had 4222 contracts at present; and he had no doubt but that they would very shortly have more. They also had a number of men—16 he believed—employed in cleaning gas fires and stoves; it being necessary that they should be kept in good order. No charge was made for this. Many of the public street-lamps had four incandescent burners in them; and they cost at present £3 10s. 4d. per year for the four burners, while at the reduced rate they would cost £3 3s. 4d. He was satisfied that there was no light equal to that produced by them at the present time, and no other street lighting surpassed them. They had changed the burners in 14 churches and 41 other places of worship during the past few years from the old flat-flame burners to the incandescent. He had an account of the result of the change from three churches and six chapels. He found that three churches before the change consumed 421,500 cubic feet; but now they only consumed 205,500 cubic feet, and the light was totally different from what it had been before. In the six chapels he had referred to, there were formerly consumed 695,700 cubic feet, and now only 362,300 cubic feet. He had often been surprised that railway companies went to the enormous expense of using the electric light at some of their stations and their goods yards and elsewhere. They must pay very large sums for it; for, as was known in Sheffield, the Corporation paid £25 a year for each of the arc lamps round the Town Hall, and in some parts of the country the charge was £30 per lamp per year. The present incandescent gaslight, with four burners, cost only £3 10s. 4d. a year; and when one compared that figure and the beautiful light the incandescent gas-lamp gave with the arc lamps and its cost, there could be, he thought, no two opinions which was the better and the cheaper. The Great Central Railway Company had placed in the approach road to their Sheffield Station these arc lights; and if the Company were paying anything like £25 per lamp for them, surely the attention of the Directors ought to be called to the expenditure they were incurring, perhaps not only in Sheffield, but also elsewhere. He succeeded in persuading his colleagues on the Board of the Midland Railway Company to light the Sheffield Passenger Station with gas, and not by the electric light as was proposed. Mr. Langdon, the Electrical Engineer, had sent a return to each Director showing the cost of supplying the electric light at eleven stations more or less like Sheffield. Here they only lighted the Goods Station, Wicker, by electricity; all the rest in Sheffield were lighted by gas. The return showed that for six months of 1901 and for the corresponding six months of 1902 the Midland Railway paid £27,467 and £26,353—or £53,820 for twelve months—for lighting these eleven stations by electrcity. In this amount Sheffield appeared; and the cost of lighting the Wicker Goods Station for half of 1901 was £2314, and for half of 1902 £1541—making £3855 for twelve months for part of the Wicker Goods Station alone. But what did the Midland Passenger Station cost for lighting by gas for twelve months? Only £727. Yet part of the Goods Station alone cost £3855 for twelve months' lighting by electricity. He also had a return of the cost of lighting sixteen stations in and around Sheffield by gas supplied by the Sheffield Gas Company; and the cost of that for twelve months was £3176, against £3855 for lighting part only of the Wicker Goods Station by electricity. And it was to be borne in mind that the Midland Railway Company made their own electric light. From the figures he had given, it was quite clear that railway companies would have to look into the matter, and see that they obtained the best light they could at a moderate cost, and so improve their dividends—some of them certainly needed attention in this direction. Railway companies were not the only bodies who were attempting to push the electric light against their own interests. The Newcastle Lighting Committee, with 200 arc lamps in the city, proposed to light the tramway route in the same way at a cost of £12,000 per annum, displacing 926 gas-lamps that were costing only £2384 a year. The Council, however, thought this was too great an expense. In the parish of St. Margaret's, Westminster, the City Engineer stated that 25½ miles of streets were lighted by incandescent gas at a cost of £5108 per year; while in St. George's Westminster, 42½ miles of streets, lighted by electricity, cost £22,146 per year. With figures like these before him, he could not understand the preference so often given to electric arc lighting—except, indeed, it was simply to be in the fashion. Last week a gentleman told him that but for his (Sir Frederick's) being the Chairman of the Sheffield Gas Company, he would sell his holding in the concern. He inquired the reason; and the gentleman told him he thought it was a falling business, and would not last. Well, he had a little account before him which showed that in 1882 the authorized capital of the gas undertakings of the United Kingdom was £67,817,000, while in 1901 (not twenty years afterwards), it was £125,651,000. The revenue in 1901 was £27,255,000, and the expenditure upon producing the gas £22,168,000. The gas sold in 1882 was 66,614 million cubic feet; and in 1901 it was 144,058 million cubic feet, or an increase of 116 per cent. in less than twenty years. Consequently, he thought that they could look upon the Sheffield gas undertaking, not as a falling business, but as one that was likely to continue progressing. He had not mentioned the high-pressure gas system; but it had been installed in different parts of the city, and was being established in the large dining hall of the Cutlers' Hall. In the Mappin Art Gallery, he was told, it was all that could be desired. He thought that after what he had said at recent meetings he need not further refer to the subject of the naphthalene trouble. The steps they had taken had been very successful; and the Company hoped soon to be able to eradicate the nuisance altogether, and so rid the staff of much anxiety.

Sir HENRY STEPHENSON seconded the motion; and it was carried without discussion.

On the motion of the CHAIRMAN, seconded by Dr. SORBY, the usual dividends were sanctioned.

Sir HENRY WIGGIN proposed a vote of thanks to the Chairman for presiding, and spoke of the feeling of envy with which Birmingham manufacturers regarded the Sheffield people, in consequence of their advantages in the lower price they enjoyed for gas for lighting and power. In Birmingham, the gas was about 1s. per 1000 cubic feet dearer; and it was not quite such good gas either.

Mr. RICHARDSON seconded the vote of thanks; and it was cordially passed.

The CHAIRMAN'S reply brought the meeting to a close.

AUSTRALIAN GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held at the Head Office, Sydney (N.S.W.), on the 29th of January—Mr. G. J. COHEN, the Chairman of the Company, presiding.

The SECRETARY (Mr. R. J. Lukey) having read the notice convening the meeting, the report of the Directors, which had previously been circulated among the shareholders, was taken as read. In the course of it, they stated that the net profits for the past half year, with the balance brought forward, amounted to £65,013; and they recommended the payment of a dividend for the six months of 9s. per share. This would absorb £56,205, and leave a balance of £8808 to be carried forward. The Engineer (Mr. T. J. Bush, M.Inst.C.E.) reported that the whole of the plant had been maintained in an efficient condition. The Enfield Municipal Council, having decided to discontinue lighting the borough with electricity, had made arrangements with the Company to instal the incandescent system of gas lighting; and the Auburn Council had also resolved to adopt this system in their borough.

The CHAIRMAN, in moving the adoption of the report, expressed the pleasure it gave him to meet the shareholders and present so satisfactory a statement as the one submitted. Compared with the corresponding period of last year, the revenue had increased nearly £12,000; but the expenditure, on the other hand, had also increased to the extent of £7000. The balance, however, was more than sufficient to meet the additional dividend required for the new capital recently created. The total amount of the Company's debentures taken up was £252,800, leaving £47,200 still for sale. They were issued at the price of £101 10s. per £100 debenture; the rate of interest being 4 per cent. per annum. The 97 new shares not issued at the closing of the books on the 31st of

December had been sold by auction, realizing good prices. The whole of the new shares (11,367) created in June, 1901, had been disposed of. The erection of the new holder was progressing very satisfactorily; and it was anticipated that it would be ready for use by the end of March, when not only would the great demand for gas experienced in the eastern suburbs, particularly during the winter months, be met, but provision would be made to meet the anticipated increased consumption for years to come. One of the most pleasing features to report was the installation of the incandescent system of gas lighting in Enfield, in place of the electric light, which had done duty for several years in the public lighting of the borough. The Auburn Council had likewise arranged for the public lighting to be done by gas; so that now, with only one or two exceptions, the whole of the Municipalities in the Metropolitan area were supplied with gas for public purposes. The increase in the number of public lights for the half year to the 31st of December was 73; making the total to date 10,680. The day consumption of gas equalled 41·3 per cent. of the total deliveries. The increase in the number of consumers for the six months was 1624; bringing up the total to 58,045.

The Deputy-Chairman (Mr. S. Dickinson) seconded the motion for the adoption of the report, which was agreed to.

The Directors and officers having been accorded an enthusiastic vote of thanks for their efficient management of the business,

The Chairman, in reply, specially referred to the services rendered to the Company by the Secretary and the Engineer.

The proceedings then closed.

EXTENSIONS AT THE TYNEMOUTH GAS-WORKS.

Some extensive additions to the Tynemouth Gas-Works have just been completed, and were inspected by the Directors and shareholders of the Company on Monday of last week. The total area of the site upon which the old and new sections of the works are built is nearly 14 acres. The present price of gas in the borough is 2s. 5d. per 1000 cubic feet, less discounts, varying from 5 to 20 per cent. The Directors have decided to reduce the price to 2s. 3d. per 1000 cubic feet next month. The Company was formed in 1848 by the amalgamation of the Borough of Tynemouth Gas Company and the North Shields Gas Company; and the development which has taken place during the past three decades will be seen from the following figures of the gas made per annum: 1872, 91,013,000 cubic feet; 1882, 146,473,000 cubic feet (increase, 55,460,000 cubic feet); 1892, 225,939,800 cubic feet (increase, 89,466,800 cubic feet); and 1902, 387,386,200 cubic feet (increase, 162,446,400 cubic feet). The amount of paid-up capital at the end of 1902 was £181,178; and the loan capital amounted to £34,950—making a total of £216,128 11s. 2d. Since 1866, the Company have paid the maximum dividend.

On arriving at the works, the guests were met by the Chairman of the Company (Mr. J. B. Williamson), the Directors, the Engineer and Manager (Mr. William Hardie), the Assistant Engineer and Manager (Mr. A. C. Hovey), and the Secretary (Mr. J. J. Carr). At the conclusion of the tour of inspection, the party were entertained by the Directors to luncheon, which was served in the store-room. Colonel Stuart, in proposing the toast of "The Tynemouth Gas Company," pointed out that in 1893 the amount of coal carbonized was 22,000 tons; while last year the figure had risen to 37,000 tons. In the same period the number of consumers had increased from 4300 to 12,000, and the profits from about £6000 to £10,000. These figures showed very plainly how the Company had progressed; and he had no hesitation in saying that they had a plant which would manufacture gas as cheaply as any similar plant in any part of England. The Chairman, in responding, said that in 1897 the shareholders gave the Directors the charge and responsibility of spending £100,000 on the new plant, &c. They had got rid of the whole of this sum, with the exception of a few hundred pounds; and he was not sure that even that had not been spent since the close of last year. The whole of the work had been carried out by their own Engineers; and he was of opinion that great credit was reflected upon these gentlemen. Mr. Hardie also replied; remarking that, although it might appear that they had spent a lot of money, he should like to say that they had not increased their capital in anything like an unreasonable manner. In thanking the Chairman for the compliments paid him, he referred to the valuable assistance that had been rendered to him by Mr. Hovey.

The new works of the Company were necessarily the chief feature in the speech of the Chairman (Mr. J. B. Williamson) when moving the adoption of the report of the Directors at the annual general meeting last Thursday. He remarked that since 1897, when the last parliamentary powers were obtained, they had spent upwards of £55,000 on the new works, which were complete and independent in every particular, with the single exception that the gas made was passed into the existing holders; and the whole of the lighting area was now being supplied entirely from the new portion. He went on to inform the shareholders that it would be necessary to apply to Parliament next year for additional powers; and it was in contemplation to adopt the plan of offering the new capital to the consumers and shareholders, as was done by several large gas companies. It might also be deemed advisable to ask for a reduction in the illuminating quality of their gas, seeing that more than one-third of their make was used for other purposes than lighting. He then dealt in detail with the operations of the past year, and concluded by acknowledging the excellent work done by the Engineers and the men under them, but for which the results could not possibly have been so good as they were. The accounts showed that the revenue last year was £57,559, and the expenditure £47,786; leaving a balance of £9773 as profit. Adding the amount brought forward (£3088), there was a sum of £12,861 available for distribution. This amount the Directors proposed to deal with as follows: Interim dividend to June 30, at the rate of 5 per cent. per annum on the consolidated and new ordinary stock, less income-tax, £3737; second half-year's dividend of 5 per cent., £3720; carrying to the reserve fund £1000. This fund would then stand at £9000, and there would be left a balance of £4404 to be carried forward. There was an increase in the make of gas last year of 18,454,400 cubic feet, equal to 5 per cent. The number of ordinary consumers on the books on Dec. 31 was 6503—being an addition of 303; and the number of consumers by automatic prepayment meters on the same date was 5505, or 1396 more than in 1901. The report was adopted, and the dividend recommended was declared. A feature of the report was a recommendation by the Directors that the salary of the Secretary (Mr. J. J. Carr) should be increased by £100 per annum.

MARKET LIGHTING BY HIGH-PRESSURE GAS.

Some time ago, the Gas Committee of the Hereford Corporation intimated their desire to have an installation of high-pressure gas lighting in the Market Hall; and the sanction of the Council having been given, the new system was adopted, and recently brought into operation; the main building being illuminated by an imposing and effective arrangement of 1000-candle and 600-candle lamps in place of the flat-flame burners previously used. The old system, with eleven pendants having twelve burners each, four pendants having eight burners each, and a lamp having one burner at the entrance, or a total of 165 burners, consuming about 825 cubic feet per hour and giving a total light approximating 2000 candles, is dispensed with. The new installation, which has been provided by the James Keith and Blackman Company, Limited, consists of twelve 3-light 1000-candle arc lamps, and four 2-light 600-candle arc lamps, giving a total light of 14,400 candles, consuming 420 cubic feet of gas per hour, or a reduction of 100 per cent. in the gas burnt, while the light is increased more than sevenfold, costing, at the present price of gas, less than 1¼d. per hour for each 1000-candle power lamp. The installation of the new system was carried out by the Corporation Gas Engineer (Mr. W. Parlby) and his staff; and the improved lighting has given general satisfaction.

INCANDESCENT GAS LIGHTING FOR WAKEFIELD.

The Wakefield Town Council have just had presented to them a report on the subject of an interview between Messrs. Ramsden and Saville, representing the Street Lighting Committee, and the Directors of the Wakefield Gas Company, with respect to a proposal to substitute incandescent burners for the present flat-flame burners in all the streets of the city in which electric mains are not laid. According to the report, there are now 851 lamps burning 3653 cubic feet of gas per hour, which, at 2s. 9d. per 1000 feet, would cost the Corporation £1774 per annum. After giving details of the suggested alterations, the report set forth that the total consumption of the 851 lamps would be 3382 cubic feet of gas per hour, and, averaging the burning at 3532½ hours, the cost, at 2s. 9d. per 1000 cubic feet, would be £1643 a year, or a saving of £131 a year on the present cost. The Company were willing to make the necessary alterations, charging only the actual cost; and they would, in future, maintain and keep all the columns, brackets, lanterns, and burners, &c., in proper order—the Corporation only lighting and cleaning, and providing and fixing all new mantles. These would, it was presumed, add to the capital expenditure about £75 per annum. The alterations would also necessitate the purchase by the Corporation of 10 more special torches (costing £2 11s. each) for lighting the lanterns. Summarizing the outlay on the various classes of lamps, the cost of the necessary alterations came to £851 8s., to which had to be added £85 for the alteration of columns and brackets, £155 for mantles for three years, and £25 10s. for torches; making a grand total of £1116 18s. Allowing for saving in the reduced consumption of gas for three years (£300), the net cost would be £816 18s. The report concluded as follows: "The question of the payment of this £816 18s. has received the consideration of the Sub-Committee, and it also formed one of the principal items of discussion with the Directors of the Company. The Sub-Committee have pleasure in informing you that, in order to assist you in carrying out these suggested alterations and improvements, the Company will agree to extend the repayment to them of the expenses thereof over a period of three years; and, further, they are prepared to provide you with the means of paying these three annual, or six half-yearly, or twelve quarterly instalments, as the case may be, without the necessity of increasing the rates of the city. This they propose to do by reducing the price of the gas in the city 3d. per 1000 cubic feet as from the 1st of April next—that is to say, from 2s. 9d. to 2s. 6d. On the basis of the actual gas bill paid for the public lighting of the city for the last twelve months ending Dec. 31, 1902, this reduction will be a saving to the Corporation of about £298 a year, which in three years (the period allowed for the repayment of the capital expenditure) will amount to £894, or £77 in excess of the net cost." The Committee had previously expressed the opinion that the incandescent gas lighting which had been experimentally adopted in various districts of the city was "far superior and in advance of the public lighting of the remaining parts;" and therefore they approved of the report, as a general proposition for the better public lighting of the city, and authorized the Sub-Committee to carry out the recommendations, subject to the necessary modifications. The report came before the Council at their meeting last Tuesday, and it was unanimously confirmed. The candid admission as to the superior lighting of the portions of the city where the Corporation's electric lamps are not in use, coupled with the unqualified endorsement of that admission by the Council, is something altogether unique in the annals of public lighting.

A TRIUMPH OF INCANDESCENT GAS LIGHTING AT THE ANTIPODES.

It will be seen by the report of the proceedings at the half-yearly general meeting of the Australian Gaslight Company, which appears elsewhere, that the borough of Enfield, an important and thriving Municipality in the western suburbs of Sydney, had decided, after some years' experience of the electric light as a street illuminant, to revert to gas. The installation was inaugurated on the 1st of February —a few days after the meeting—and was made the occasion of a festive gathering in the local Council Chambers. The Mayor (Alderman T. Hodson) presided, and in proposing "Success to the Enfield Lighting Scheme," explained the circumstances which had necessitated the installation of the electric light 13 years ago. It was, he said, because of a difference in price in its favour, and the fact that the gas-mains could not be taken to all the places at which it was considered they would be required. The original intention was to make the contract extend over 21 years, but he succeeded in limiting it to 12 years—obtaining the voice of the Council by a majority of one. The ratepayers of Enfield were under an obligation to Mr. Lukey (the Company's Secretary) for what he had done, and for the concessions he had made; and in calling upon the company to drink the toast, he asked them to couple with it that gentleman's name. Mr. Lukey, who was received with applause, said he was grateful for the manner in which the toast had been received. The Company he represented looked upon the electric light as a friendly rival. He went on to say that the step taken by Enfield in reverting to gaslight was only in accord with what was being done in older and more pretentious places. In support of this statement, he cited the case of Manchester, where the Gas Committee had made successful strides in the lighting of the leading streets of the city. It was his opinion that for many years gaslight would not be put in the shade. He appreciated the kind things said by the Mayor, and congratulated the residents upon having a good light for the borough.

ELECTRIC LIGHTING NOTES.

The Lichfield Corporation and their Order.

The Corporation of Lichfield have obtained a Provisional Order for electric lighting; but they appear to be hesitating as to what to do with it. The period allowed will expire early in July; and they recently addressed the Board of Trade on the subject of obtaining an extension of time. The Board replied that they could not grant it, but said that if the Corporation would furnish them with information as to the steps they are taking to carry out their obligations, they would be prepared to consider the question of deferring for a certain period the revocation of the Order. Thereupon the Town Clerk (Mr. Herbert Russell) was directed to communicate with two firms of Consulting Electrical Engineers, and ascertain their lowest terms for reporting on (1) the probable cost of carrying out the scheme, (2) the benefit to be derived if the Council decided to lease their powers, and (3) generally as to the best course to be adopted in the interests of the ratepayers. On the receipt of the replies from these firms, it was decided to obtain from one of them a full report, and also to appoint a deputation to wait upon the Board of Trade, and obtain, if possible, some idea of the length of time to which they would defer the revocation of the Order. Meanwhile, the Ratepayers' Association have been occupied with the subject; and at a meeting held a few days ago they passed a resolution expressing themselves in favour of the Corporation leasing their powers; and the Secretary was instructed to forward a copy of it to the Council.

"The Light that Failed."

"At this point the electric light went out, and the Council Chamber was in darkness. Members here and there lighted wax vestas, which displayed rather than dispelled the gloom. A motion was made to adjourn the meeting, and this was agreed to—the Mayor holding a match in his left hand." This extract from a report of the proceedings of the Plymouth Town Council yesterday week is interesting, if not instructive. The extinguishing of the electric light was not confined to the Council Chamber, but was general throughout the town. When the Council reassembled on the following day, it was explained that there had been an accident to an engine at the electric light works; but the staff soon got the stand-by plant to work, and the lighting was resumed. Mr. Debnam, who made this explanation, used the incident as the text for a little sermon on the value of reserve plant in case of emergency. Certainly, the reserve plant proved useful, and the interruption of the light was not of long duration. It was, however, sufficient to cause a great deal of confusion and inconvenience in business places; and the real object-lesson, as the more prudent learnt, is that it is better to keep a reserve of one's own in the way of gaslight. Everybody who has followed the progress of electric lighting knows that the unreliability of the system has earned for it the appellation which stands at the head of this paragraph. And this unreliability manifests itself at the most inopportune times. For example, Eastbourne inaugurated a few days ago, with the customary luncheon, a new installation which has been carried out there, so that there are now 66 arc lamps in the principal thoroughfares and 33 along the sea-front. After the luncheon the company drove to the electric lighting works at Roselands, and then to the sea-front, where the light was switched on. In the evening, however, some of the arc lamps went out; and in the Terminus Road shops, at the Park Exhibition, and elsewhere, inconvenience was caused by the light being almost out for three-quarters of an hour. This was attributed to a temporary mishap at the works.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 689.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
500,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18¾—19¾	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 13	6½	Bombay, Ltd.	5¾—6¼	..	5 4 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4¾	..	5 9 5
380,000	Stk.	Feb. 26	12	Brentford Consolidated	242—247	..	4 17 2
286,700	,,	,,	9	Do. New	177—182	..	4 18 11
50,000	,,	,,	5	Do. 5 p.c. Pref.	133—138	..	3 12 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	110—113	..	3 10 10
220,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	207—212*	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk.	151—155*	−1	5 0 0
460,000	20	Sept. 26	10	British	39½—40½	..	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c.	—	..	—
82,850	10	,,	9	Do. 7 p.c.	—	..	—
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10½—11	..	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
150,000	20	July 11	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
1,375,000	Stk.	Feb. 26	5	Commercial 4 p.c. Stk.	105—108	..	4 12 7
503,750	,,	,,	4½	Do. 3½ p.c. ,,	99—102	..	4 13 2
407,812	,,	—	3	Do. 3 p.c. Deb.,,	90—93	..	3 4 6
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	115—125	..	6 8 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Feb. 26	5½	Crystal Palace Ord. 5 p.c.	115—120	+3	4 8 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
106,158	,,	Jan. 15	5	Do. 5 p.c. Deb. Stk.	137—140	..	3 11 5
486,090	10	Jan. 29	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 12	4½	Gaslight and Coke: 4 p.c. Ord.	82—84	−1	5 4 8
2,600,000	,,	,,	3½	Gaslight and Coke: 3½ p.c. max.	85—87	−1	4 0 6
3,799,735	,,	,,	4	Gaslight and Coke: 4 p.c. Con. Pref.	105—108	−1	3 14 1
4,193,975	,,	Dec. 11	3	Gaslight and Coke: 3 p.c. Con. Deb.	91—93	..	3 4 6
252,500	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	90—95*	+2½	5 5 3
70,000	10	Oct. 30	8	Hongkong & China, Ltd.	15—16	+½	5 0 0
3,800,000	Stk.	Nov. 13	10	Imperial Continental	204—207	..	4 16 7
473,600	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	100—103	..	3 8 0
165,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	115—120*	+3	5 0 0
561,000	Stk.	Feb. 26	10	Liverpool United A	219—221	..	4 10 6
718,100	,,	,,	7	Do. do. B	161½—163½	..	4 5 8
306,083	,,	Dec. 31	4	Do. do. Deb. Stk.	114—116	..	3 9 0
75,000	5	Dec. 11	5	Malta & Medn., Ltd.	4½—5	..	5 0 0
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	105—109	..	4 11 9
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 13	3½	Monte Video, Ltd.	9½—10½	..	6 13 4
1,515,892	Stk.	Feb. 20	4½	Newc'tle & G'tesh d Con.	103¾—104¾	+1	4 6 2
376,855	Stk.	Jan. 2	3½	Do. 3½ p.c. Deb.	97—98	..	3 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	143—148	..	5 8 1
600,000	5	Sept. 26	7	Ottoman, Ltd.	6—7	..	5 0 0
					* Ex. div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
105,005	Stk.	Jan. 15	6½	Ply'mth & St'house 5 p.c	127—132	..	4 12 9
851,070	10	Oct. 15	7	River Plate Ord.	10¾—11¼	..	6 4 5
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
250,000	10	Sept. 26	8	San Paulo, Ltd.	12—13	+½	6 3 1
135,000	Stk.	Sept. 11	10	Sheffield A	238—240	..	4 3 4
209,984	,,	,,	10	Do. B	238—240	..	4 3 4
523,498	,,	,,	10	Do. C	238—240	..	4 3 4
103,235	Stk.	Sept. 26	5	Shrewsbury Ord. 5 p.c.	113—116	..	4 6 2
6,000,000	Stk.	Feb. 12	5½	South Met., 4 p.c. Ord.	119—121	−1	4 8 2
1,780,000	,,	Jan. 15	3	Do. 3 p.c. Deb.	91—93	..	3 4 6
380,940	Stk.	Nov. 13	5	Southampton Ord.	103—107	..	4 13 6
87,950	,,	Jan. 15	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Feb. 26	6	Tottenham and Edmonton: A. 5 p.c.	115—120	..	5 0 0
300,520	,,	,,	4½	Tottenham and Edmonton: B. 3½ p.c.	93—96	..	4 13 9
182,380	10	Dec. 30	8	Tuscan, Ltd.	8¾—9¼	..	8 8 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
730,872	Stk.	Mar. 12	5	West Ham, 5 p.c. Ord.	95—100*	..	5 0 0
				WATER COMPANIES.			
780,662	Stk.	Dec. 30	11½	Chelsea, Ord.	315—325	..	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref.	150—155	..	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	138—143	..	3 2 11
175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
1,720,560	Stk.	Oct. 15	8	East London, Ord.	228—233	..	3 8 9
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	97—99	..	3 0 7
700,000	50	Dec. 11	8	Grand Junction: 10 p.c. max.	117—122	..	3 5 7
310,000	Stk.	Sept. 26	4	Grand Junction: 4 p.c. Deb.	125—130	..	3 1 7
708,000	Stk.	Feb. 26	10½	Kent	295—305	..	3 8 10
160,000	,,	,,	7	Do. New, 7 p.c. max.	195—205	..	3 8 4
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.	305—315	..	3 9 10
406,200	100	,,	8½	Do. 7½ p.c. max.	220—230	..	3 13 11
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Feb. 12	12⅝	New River, New Shares	390—400	..	3 4 0
1,000,000	Stk.	Jan. 29	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
902,300	Stk.	Dec. 11	7	Southwark and: Ord.	203—208	..	3 7 4
126 500	100	,,	7	Southwark and: 7½ p.c. max.	195—205	..	3 8 4
489,200	Stk.	,,	5	Southwark and: 5 p.c. Pref.	151—154	..	3 4 11
1,019,585	,,	Oct. 15	4	Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 11	10	West Middlesex	290—300	..	3 6 8
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb.	95—97*	..	3 1 10
					* Ex. div.		

The Electric Light Squabble at Taunton.

In accordance with the intimation given in the "JOURNAL" last Tuesday, a prominent feature in the business at the meeting of the Taunton Town Council on that day was the resignation of Alderman Potter, the Chairman of the Electric Lighting Committee, and several members of that body. Alderman Potter, in stating his reasons for the course he had adopted, said that, mainly, as the result of gross and wilful misrepresentation, and partly from a misapprehension of the facts, an embittered spirit of prejudice and animosity had sprung up in the town against him, and, in a lesser degree, against the Committee. This feeling had arisen partly owing to the discharge of an employee at the electric light works, whose services, he contended, were no longer required, and partly as the result of the meter question. He would only repeat what he had already stated with regard to the latter—that he knew nothing about it until a month or so before the trouble arose; and he candidly admitted that, from the explanation given to him by the Borough Electrician, he did not see any dishonesty in it, or that any consumer was defrauded to the extent of a penny. That was his opinion still. While the principle was perfectly right, he admitted that the practice was wrong with respect to the meters; and it had been discontinued. He had already made two public statements on this matter; and he adhered to everything he had said, and withdrew nothing. The Committee had since been threatened with a Board of Trade inquiry. If any charges could be formulated, and grounds, however slight, could be furnished for an inquiry, then by all means have it. So long as the disaffection was confined to outsiders, it made little difference to him. For nearly twelve years he had filled the responsible position of Chairman to the Committee, and during that time he had worked hard to make the electric light undertaking a success. He had no axe of his own to grind; and when accusations were brought against him of dishonesty in a matter that could be of no possible benefit to himself, and insinuations of corruption, which he challenged the world to prove, were whispered abroad, then he felt that it was time to wash his hands of the whole affair. In tendering his resignation, he reminded the Council that they had invested in the electric light works £60,000 of the ratepayers' money; and the aim and object of the Committee from first to last had been to make the undertaking a financial success. Judging from the opposition it had received, they might almost say that the object of the people of the town had been to wreck the undertaking. The other members of the Committee who had resigned also stated their reasons for so doing—generally on similar grounds, and out of loyalty to the Chairman. After some discussion, Alderman Spiller characterized the resignations as a serious thing for the ratepayers and the Council. He proposed a vote of confidence in the members of the Committee who had resigned, and asked them to reconsider their decision in the best interests of the town. The motion was carried unanimously. Alderman Potter thanked the Council for the expression of confidence, but added that he was not prepared just then to say what he and the other members of the Committee would do. They would, however, consider the matter, and give their decision at another meeting.

Marylebone's Heavy Load.

A short time ago, the Marylebone Borough Council passed a resolution to obtain the opinion of Mr. Asquith as to the possibility of the award of £1,212,000, as the price to be paid by the Council for the Marylebone property of the Metropolitan Electric Supply Company, being annulled or modified, and as to the consequences of a failure to carry out the Umpire's decision. The opinion was to be made known at a special meeting of the Council, at which, however, the Electric Lighting Committee proposed to persist with their recommendations—viz., (1) that application be made to the London County Council to sanction the raising of a loan of £1,274,000 to cover the amount of the award and the costs of the arbitration; and (2) a further loan of £400,000 in order to provide, exclusive of the cost of site, a local generating station which will render a self-contained system and a direct-supply service locally practicable, and, it is held, profitable. Meanwhile, for the first two years after the acquisition of the Company's property, and pending the erection of the station, electric current will have to be obtained in bulk of the Company from their generating station at Willesden, with consequent estimated loss in that period of £43,475. On the other hand, according to the calculations of Mr. A. Wright, the Council's Electrical Adviser, profit will accrue from the first operation of the Council's own generating station, and will yearly continue thereafter. Assuming completion by 1905, he estimates a profit for that year of £13,500, and afterwards increasing profits until £21,700 is realized in 1915. The sum named in the award is generally regarded by the local ratepayers, as well as by the members of the Council, as excessive. The special meeting was duly held last Thursday evening, when Mr. Asquith's opinion was made known. It was to the effect that the award could not be set aside or sent back to the Umpire for modification. If, as he supposed, the action which the Company were bringing against the Council was for the specific performance of their obligation to take over the undertaking for the amount of the purchase-money and compensation awarded, the judgment in the action might, if wilfully disobeyed, be enforced, by ban of the Court—by sequestration against the corporate property; but a reasonable time would be granted for compliance. It was decided that application should be made to the London County Council for their sanction to the borrowing of the above-mentioned sum of £1,274,000; that the expenditure during the next two years of £400,000 be authorized, exclusive of the cost of site, provided that the sum could be raised by loan; that application be made to the Council for their sanction to the borrowing of this sum; that inquiries be made of them as to the terms upon which they would advance the sums; and that the Lighting Committee be authorized to agree with the Company as to the carrying on of the undertaking in Marylebone until such time as the Council have their own generating station. In connection with this question, the following paragraph, taken from last Friday's "Pall Mall Gazette," is worth quoting, as it

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so well represents the views of the "JOURNAL" on the matter: "The Marylebone Borough Council has got itself and the ratepayers into a pretty mess over the mad scheme for municipalizing the electricity supply. What the Council, which is dominated by a strong Conservative and common-sense element, wanted to tie itself up with such a wild-cat project for, nobody except the hotheads who are responsible for it can guess. Had the Council taken up the matter at an early stage, when the capital value of the undertaking had not been inflated by compensation claims, or had waited until the statutory period had elapsed before acquiring the undertaking, the step would have been within the bounds of reason. But to buy a pig in a poke as the Council has done, and at the top of the market, was as municipally foolish as it has proved disastrous. The ratepayers have protested, and the councillors have taken legal advice, only to find that they are bound by the recent arbitration to proceed with the undertaking at a capital outlay of £1,674,000. This will be a sharp lesson to the zealots for collectivism in every other municipality; and it may come in time to prevent the carrying out of some other projects of the same kind that are in the air."

HISTORY OF THE SHEFFIELD WATER-WORKS.

Lecture by Mr. W. Terrey.

An interesting lecture on the history of the local water-works was delivered in the large hall of University College, Sheffield, on the 31st ult., by Mr. WILLIAM TERREY, the General Manager of the Water Department of the Corporation. The Chairman of the Water Committee (Alderman Gainsford) presided.

In the course of his lecture, Mr. Terrey stated that, according to the earliest records, the first attempt to obtain a supply of water for Sheffield was by a small storage at the junction of the Don and Sheaf. This was an important source until the then very small town had extended, when wells were dug, and advantage was taken of natural springs. Some of these wells were public, some private; and, for general convenience, water-carts with barrels upon them were drawn about by men, and women gained a livelihood by hawking water in "kits" or buckets, which they carried on their heads. It was then the duty of apprentice lads and servant lasses on Sunday evenings to fetch the washing water for use on Mondays. The supply for the house was always provided the night previous, and a good water butt was almost a necessary appendage. The Town Trustees bore the expense of sinking the first public wells and keeping them in proper repair. They dated from 1626. The names and sites of some had been preserved, but others had been completely lost.

The first distinctly artificial work in Sheffield for the purposes of public water supply was the construction, by a person named Barker, of a reservoir in what is still known as Barker Pool. The water was carried from the reservoir in pails and barrels. This reservoir was walled round in 1631 by a Mr. Rollinson, a Sheffield mercer, and was enlarged in 1672. A curious account is given of one of the uses to which Barker Pool was put in its earlier days. In the event of a fire, the water could be directed to most parts of the town. All the channels were then in the middle of the streets, which were generally in a very disorderly state—manure heaps often lying in them for a week together. About once every quarter the water was let out of Barker Pool for the purpose of cleansing them. The bellman gave notice of the exact time, and the favoured streets were all bustle, with a row of men, women, and children waiting with mops, brooms, and pails the arrival of the cleansing flood. Some threw the water up against their houses and windows, some raked the garbage into the channel, some washed their pigs, some swept the pavement, and youngsters threw water over their companions, or pushed them into the widespread torrent. In about half-an-hour the supply of water was exhausted. On the occasion of fires, the water was let off through the channels in the middle of the streets; and to make it available, leathern buckets were hung in the church and Town Hall. As Barker Pool ceased to be used for its original purpose, it became a receptacle for rubbish and a nuisance; and in 1793 it was done away with.

The lecturer then dealt with the early engineering efforts to provide a more efficient water supply. In 1697, Peter Whalley, a Nottingham engineer, leased the "Isle of Wight"—a piece of land just above the Lady's Bridge. It was his intention to erect an engine near the river, for forcing the water to the reservoir at Barker Pool; but he died when he had only made small progress with the undertaking. Other efforts were put forth to pump water from the river into the town. Their failure was believed to be due to the fact that the only means of conveying the water was by wooden pipes. These would be weak and unreliable at the joints; and, while efficacious for carrying the water downwards by gravitation, they would not be suitable for pumping water from a lower to a higher level. It, therefore, appeared probable that what was now known as a gravitation system of supply thrust itself upon the attention of the promoters of the works. Accordingly, about 1735 6, steps were taken to construct reservoirs a short distance outside the town, where springs of pure water yielded a copious supply. Five reservoirs were built, above and below Langsett Road, and following these was the provision of the Old Great Dam in the Crookesmoor Valley, with an area of about four acres and a capacity of rather more than 21 million gallons. The lecturer related the observations made by the constructor of this dam—Mr. Joshua Matthewman—who, immediately after the dam was filled with water, exclaimed, "There, let Sheffield grow as large as it will, it will never want more water." As a fact, the reservoir does not contain sufficient water to furnish the present population of Sheffield with two days' supply. After referring to the succession of reservoirs formed in the Crookesmoor Valley, Mr. Terrey showed the site of a stone cistern which used to be in Division Street, and contained about 40,000 gallons—the stock of water kept

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ready for distribution in the town. Water was then only on three times a week, and when scarce only twice a week, for two hours.

Sheffield continued to develop, and its population to increase, until in 1828-9 the number of inhabitants was nearly 90,000—just double what it had been at the beginning of the century. Reference was then made to the advent of a number of London speculators, who started a rival water scheme for Sheffield, proposing to obtain water from numerous springs to the west and north-west of the town, and from the valley of the Sheaf in the neighbourhood of Dore. The scheme led to the proprietors of the existing water-works securing an Act of Incorporation, authorizing the construction of a large service reservoir at Crookes, a conduit or watercourse from Redmires to Crookes, and the construction at Redmires of two reservoirs to impound the waters of the upper part of the Wyming Brook. For years there was a prejudice against "Company's water," brought into the house at so much a year. When the calling of water-carrier was in danger, many conservative folk continued to do as their fathers had done—daily to buy a pailful or two for a penny. The lecturer traced the gradual development of the water-works, from the superseding of the old wooden pipes by cast-iron pipes, to the construction of the upper and lower reservoirs at Redmires, the invasion of the valley of the Rivelin, the attempt in 1852 to divert water from the Derwent Valley, and the construction of reservoirs in the Loxley Valley. Touching on the general sources of supply, he pointed out that the gathering-grounds are the breezy, elevated, extensive moorlands lying to the west and north-west of the city, which form part of the eastern slope of the backbone of England. The rainfall, which has been continuously gauged during the last 67 years, averages exactly 40½ inches per annum. During three consecutive dry years, about 18½ inches could be collected.

Touching on the disaster in connection with the Dale Dyke reservoir, in the Loxley Valley, Mr. Terrey recalled the landslip which led to a settlement in the outer slope of the embankment, causing the puddle wall to subside, and the water to flow over the top of the bank. In a few minutes the reservoir was destroyed, and the liberated waters, about 700 million gallons, poured down the valley at the rate, it was said, of a mile a minute, carrying with them death and destruction. That terrible catastrophe caused the loss of 244 lives, and the destruction of an enormous amount of property. The Water Company paid no less than £373,000 in respect of injury and loss sustained. The disaster, which occurred about midnight, on Friday, March 11, 1864, was unique, so far as this country is concerned. Power was obtained, under the subsequent Act of 1867, for the reconstruction of the reservoir on another site. The embankment of the new reservoir was made about a quarter-of-a-mile higher up the valley, to avoid the treacherous ground upon which the old bank stood. The disaster was succeeded by an increase in the water charges of 25 per cent. for 25 years. That had since been taken off, the last half disappearing in 1901.

Glancing rapidly at the progress of events, the lecturer pointed out that the Water Company, under pressure of the Corporation's requisition, first afforded a constant supply in July, 1869. Next he dealt with the acquisition of the undertaking by the Corporation, effected in January, 1888, the amount paid being £2,092,014, compared with £41,800 paid in 1831 by the Company for the then small existing works. There were, he continued, few towns supplied by gravitation where such a wide range in height obtained. The minimum pressure was about 60 feet—sufficient to supply water to the top storeys of houses in the highest parts of the district. The total daily quantity distributed varied from 10 to 14 million gallons per day, of which nearly one-half was for trade and manufacturing purposes.

In conclusion, Mr. Terrey gave some interesting information relating to the quality of the Sheffield water; showing that while it is excessively soft, it is free from impurities, and as wholesome as any in the kingdom. For trade, manufacturing, and boiler purposes, he said it was unrivalled.

In a second lecture, delivered on the 7th inst., Mr. Terrey gave a description of the works more recently undertaken for the supply of Sheffield. He said that as far back as 1867, the Water Company obtained powers to construct two reservoirs in the Ewden Valley, and the whole of the land required for the scheme had been purchased; but the works had not yet been commenced. The proposed Broomhead reservoir would have an area of 115 acres and a capacity of 1050 million gallons; and the More Hall reservoir an area of 70 acres and a capacity of 562 million gallons. Parliament had on several occasions granted more time for the construction of these works; and under the Act of 1901 it was further extended to 1925. Owing to the good fortune of Sheffield in obtaining a share of the waters of the Derwent, it had been decided to postpone these works until the approaching exhaustion of the Derwent water. The Langsett reservoir would have an area of 120 acres, or nearly 5 acres larger than the one at Damflask. The drainage area was 5203 acres, and the surface area would constitute a lake some 1¼ miles in extent, and would be a distinct addition to the beauty of the neighbourhood. The Underbank reservoir, which is situate about two miles lower down the valley, would be wholly used for supplying compensation water to the mills and riparian owners upon the streams and rivers below. Its general features were similar to those of the Langsett reservoir, and its capacity would be 650 million gallons. It was anticipated that it would be ready for use within a short time of the completion of the Langsett reservoir. The total yield of the Little Don watershed was 11,286,201 gallons per day, of which 4,516,712 gallons had to be sent down the stream as compensation. Rotherham and Doncaster were entitled to 2,600,000 gallons per day, the rural districts of the Don to about 500,000 gallons, and Sheffield the remainder—sufficient only to last the city until about the year 1910.

Turning to the Derwent Valley scheme, Mr. Terrey said that in 1898 it became known to the authorities in Sheffield that the Corporations of Leicester, Derby, and Nottingham were independently seeking powers

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to acquire rights over the Derwent all the way up to the moorlands of the Peak. This area had been regarded as the natural and proper source of supply for Sheffield on the exhaustion of its existing and authorized works; it being quite the last unappropriated area within easy distance. The Corporation, therefore, promoted a Bill, with Rotherham as an active ally, with the object of defending the interests of the city, and of obtaining a fair share in the yield of that watershed. As the result of a very lengthy and costly parliamentary struggle, and much negotiation between the parties immediately interested, a fairly equitable compromise was arrived at. The yield of the watershed was apportioned as follows: Sheffield and Derby, each 25 per cent.; Leicester, 35·72 per cent.; and Nottingham, 14·28 per cent. The result of the joint action of the towns was the passing of an Act authorizing the formation of the Derwent Valley Water Board, consisting of thirteen members—Sheffield and Derby each sending three, Leicester four, Nottingham two, and the county of Derby one—with an appointed Arbitrator. Alderman Gainsford was the Chairman of the Board. The works authorized by that Act were on a very extensive scale, and 20 years were allowed for their completion. There would be five reservoirs. Two of them would be situate above the Derwent Hall, two in the Ashop Valley, and the fifth at the junction of the Ashop and Derwent, and extending from Ashopton towards Bamford This would be the largest and lowest of the reservoirs, and used chiefly for compensation purposes. Each reservoir would be two miles in length, thus giving ten miles of lakes. Their capacity would be 10,000 million gallons, and they would receive the rainfall from 31,694 acres, the available yield being estimated at about 30 million gallons per day. The cost of the works was estimated at £6,000,000.

Briefly summarizing the water supply of the city, Mr. Terrey gave the following particulars: There are altogether ten completed reservoirs, and they contain, when full, 3687½ million gallons. The total drainage area is 15,703 acres. The total available water during three consecutive dry years is 17,524,547 gallons per day, of which an average of 9,059,374 gallons has to be sent down the streams as compensation water; leaving for the supply of the city and district 8,465,173 gallons per day. The works in the Little Don Valley will add for Sheffield 3,180,821 gallons; from the Ewden Valley watershed, 4,624,627 gallons; and the share of Derwent Valley scheme is estimated at 6,000,000 gallons—making a grand total of 22,270,621 gallons. This quantity, he said, was sufficient to supply a population of about 750,000. The Corporation had thus made provision for the constantly increasing needs of the city for the next 35 to 40 years.

In conclusion, Mr. Terrey said the Corporation had fulfilled the pledge they gave in 1887 with reference to the prevention of lead poisoning and the remission of the 25 per cent. charges added to the rate in consequence of the disaster of 1864. Notwithstanding the heavy price paid for the water undertaking, the Corporation had wiped off the capital debt to the extent of nearly £120,000. They had, too, an accumulated surplus in hand of £86,116. The amount paid by the Corporation for the undertaking was £2,092,014; and he now estimated it to be worth £3,390,630.

METROPOLITAN WATER BOARD.

Constitution of the Board—The First Meeting.

The members of the Metropolitan Water Board have all now been chosen, and the following is a complete list:—

Avern, E.—Fulham B.C.
Baker, C. E.—Beckenham, Bromley, Chislehurst, Penge, Bexley, Dartford, Erith, and Footscray U.D.C.
Barnard, E. B.—Hertfordshire C.C.
Beachcroft, R. M.—L.C.C.
Benn, I. H.—Greenwich B.C.
Bradford, H. W.—Westminster C.C.
Brass, J. H.—Chelsea B.C.
Burns, J., M.P.—L.C.C.
Burrell, W.—Lewisham B.C.
Burt, C.—Surrey C.C.
Burt, H.—Hornsey and Wood Green U.D.C.
Butter, H. J.—Woolwich B.C.
Chamberlen, T. — Hammersmith B.C.
Clarke, H.—L.C.C.
Colvile, Lieut.-Col. C. F.—Kensington B.C.
Cornwall, E. A.—L.C.C.
Courthope, G. J.—Kent C.C.
Croft, R. B.—Lea Conservancy.
Dawes, J. A.—Southwark B.C.
Dickinson, W. H.—L.C.C.
Doll, C. F.—Holborn B.C.
Elliott, G. S.—Islington B.C.
Glass, J.—Stoke Newington B.C.
Harris, C. T.—City Common Council.
Harris, H. P.—L.C.C.
Howes, Enos.—Finsbury B.C.
Huggett, E. P.—Middlesex C.C.
Idris, T. H. W.—L.C.C.
Karslake, J. B. P.—Paddington B.C.
Kettle, J.—West Ham T.C.
King, A. W. W.—Ealing T.C. and Acton and Chiswick U.D.C.
Knight, T. L.—East Ham U.D.C.
Lawton, J. H. S.—Brentford, Hampton, Hampton Wick, Hanwell, Heston and Isleworth, Sunbury, Teddington, and Twickenham U.D.C.
Layman, A.—Bermondsey B.C.
Lea-Smith, J.—St. Marylebone B.C.
Lidiard, J.—Wandsworth B.C.
Lyon, R.—Camberwell B.C.
Malone, P. B.—Tottenham U.D.C.
Mann, E.—Stepney B.C.
M'Dougall, Sir J.—L.C.C.
Morgan, D. J., M.P.—Essex C.C.
Musgrave, C. G.—Leyton U.D.C.
Pickersgill, E. H.—Bethnal Green B.C.
Pinkham, C.—Willesden U.D.C.
Pritchard, C. F.—Hampstead B.C.
Probyn, Lieut.-Col. C.—Westminster C.C.
Radford, G. H.—L.C.C.
Richards, T. M.—Lambeth B.C.
Ritchie, Sir J. T.—City Common Council.
Russell, H. W.—Thames Conservancy.
Sanders, J. H.—Edmonton, Enfield, and Southgate U.D.C.
Sandhurst, Lord—L.C.C.
Sawell, H. T.—Shoreditch B.C.
Scotter, Sir C.—Kingston T.C. and East and West Molesey, Esher and the Dittons, Ham, Surbiton, Barnes, the Maldens and Coombe, and Wimbledon U.D.C.*
Smith, W. R.—Deptford B.C.
Spratt, L. W.—West Ham T.C.
Thornley, J.—St. Pancras B.C.
Tozer, A. H.—Buckhurst Hill, Chingford, Loughton, Waltham, Wanstead, and Woodford U.D.C.
Ward, H.—L.C.C.
Watts, W.—Battersea B.C.
Welby, Lord—L.C.C.
White, E.—L.C.C.
White, P. A.—Poplar B.C.
Whiter, J. W.—Hackney B.C.
Wilkinson, C. T.—Walthamstow, U.D.C.
Wood, T. M'Kinnon—L.C.C.

* Sir Charles Scotter was elected a member of the Board during his absence abroad. He has written to the Town Clerk of Kingston declining the honour, as he finds himself "unable to give the necessary time and attention to the very important business of the Board."

The first meeting of the Board has been summoned by the Local

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT, MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000		

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LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

Government Board for Thursday, the 2nd prox., at three o'clock, at the Council Chamber of the Privy Council, Downing Street. Mr. FitzRoy, the Clerk of the Council, will preside at the commencement of the proceedings; but the first business to be transacted will be the election of a temporary Chairman, who will then take the chair. The matters to be subsequently considered at the meeting are: (1) Whether any, and if so what, salaries shall be assigned to the offices of Chairman and Vice-Chairman of the Board. (2) The appointment of persons to these offices. (3) The appointment of a person to act temporarily as Clerk of the Board, until the Clerk is appointed. (4) Whether or not the next meeting shall be held by adjournment from the first meeting, and in either case the time and place for that meeting; also regulations for the notification and convening of that meeting, and for the proceedings and business to be transacted at it. (5) Any other business the Board may think necessary.

HULL CORPORATION WATER SUPPLY.

Annual Report of the Engineer.

The Water and Gas Engineer of the Hull Corporation (Mr. F. J. Bancroft, B.Sc., Assoc.M.Inst.C.E.) has presented to the members of his Committee his sixth annual report, which deals with the work of the Water Department in the year ending Dec. 31. Beginning with rainfall, he shows that Hull, like most other places, suffered last year from a deficiency, though rain fell on 194 days, compared with 171, 187, 152, and 157 days in the four preceding years. The actual rainfall in the five-year period was 119·89 inches, whereas the quantity required to be equal to the average was 135·10 inches; so that there was a deficiency of 15·21 inches, or 56 per cent. of an entire year's rain, while for the past twenty years it was practically equivalent to three-quarters of a year's fall. The depth of water in the wells at Springhead was, however, 30 feet, compared with 29 feet in 1901; but at Cottingham it was 35 feet against 40 feet. Mr. Bancroft points out, in considering the low rainfall during the past year, and the fact that it followed a succession of dry seasons, accompanied by a low level in the chalk, that this has occurred before. The year 1890 came after several dry years; and from June to September the water in the Springhead well was only 8 feet high. The greatest quantity of water supplied by each pumping-station in one day during 1902 was: Springhead (May 15), 7,738,000 gallons; Cottingham (May 9), 5,704,000 gallons. The total bulk of water pumped into the district was 3,352,207,000 gallons, against 3,377,259,000 gallons in 1901, and 3,369,769,000 gallons in 1900. The consumption per head was 36·58 gallons, compared with 43·5 gallons in 1893; the domestic consumption showing a falling off from 38·3 to 28 gallons. During the year, 8·7 miles of new mains were laid; bringing up the total length to 224·45 miles.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Perth Town Council on Monday spent a long time upon gas matters, discussing questions of improvement at the works. The Gas Committee reported that on Feb. 10 they visited the gas-works, and the Manager, Mr. W. B. M'Lusky, fully explained to them his plans for the coal and coke handling plant. The Committee unanimously agreed to recommend the Town Council to adopt the scheme. The Council did so without remark, so that the work is to be proceeded with. The Committee also reported that they had had before them a letter from Mr. M'Lusky, in which he submitted particulars of two schemes for the production of refined tar and other residuals—the one plan to cost £500 and the other £750. The Committee, by a majority, agreed to recommend that the latter be adopted. By it they would be able to distil tar fractionally, producing two grades of naphtha, two grades of creosote, and pitch. This recommendation was moved in the Council, and was supported with the remark that Mr. M'Lusky had assured the Committee that the scheme would in a few years almost repay the outlay upon it. A counter-motion was submitted, upon the ground that they had not sufficient information before them on the subject. They were tired, it was said, of being told that everything submitted to them by the Gas Manager would be an advantage; and the public were beginning to get tired of the continual large expenditure upon the gas-works. There was no other department where such expenditure would be tolerated without inquiry. It transpired that part of the scheme is to furnish tar for the Paving Department of the Corporation, which led one of the councillors to remark that he thought it was to be one of their best paying schemes, as they had a market for what they were going to manufacture. The Council, by a majority, adopted the recommendation of the Committee.

The erection of the new gas-works for the Corporation of Peebles has not yet been begun; but it was reported to the Town Council this week that arrangements are being made for the laying of the mains into the town and the construction of a railway siding into the new works.

The Arbroath Town Council on Monday had under consideration the suggestions by Mr. A. C. Young, the Gas Manager, that apparatus should be obtained for the gas-works, at a cost of about £2000. The proposed new plant includes two exhausters and engines, tar, ammonia, and water pumps, a rotary scrubber, tar trough, gas engine, &c. The Gas-Works and Electric Lighting Committee reported that, having considered Mr. Young's recommendations, they thought it might be satisfactory to have an independent opinion from an experienced gas engineer and manager on the subject. They found from Mr. Young that this would be also satisfactory to him; and a Sub-Committee was appointed to consult an experienced man within an accessible distance, and obtain his opinion and advice. This Sub-Committee reported that they had arranged for an interview with a Gas Engineer and Manager of the

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best standing, and had also had an opportunity of seeing through the works under his charge, and of explaining to him the position of the Arbroath Gas-Works, and discussing with him Mr. Young's recommendations. In the works they visited, they found that plant very similar to what is in use in Arbroath had been recently removed and replaced by improved plant of the description recommended by Mr. Young; and they satisfied themselves that the results had been highly advantageous. They were therefore able unhesitatingly to report to the Committee that Mr. Young's recommendations should be adopted. The Gas Committee approved. In speaking to the report, Mr. Robbie stated that the Sub-Committee had seen in Dundee tower scrubbers which would be considered modern compared with what they had in Arbroath. These had been discarded, and rotary scrubbers substituted. The rotary scrubber recommended by Mr. Young would make 20 per cent. more ammonia than they had been getting. They had been making 80 tons of sulphate a year in Arbroath; and with the new scrubber they would have 16 tons more. This, at £11 per ton, would give an additional revenue of £176. The scrubber would cost £800; and supposing they allowed 6 per cent. to meet interest and depreciation, this would amount to £48 a year. There would thus be a balance of £128 left. Some people wished that, before they went in for this new scheme, they should see the results to be obtained from the plant put into the gas-works last year. It was not necessary to wait, because the Committee had the information in their possession now. The new plant would show an advantage far beyond what the Manager promised last year. Formerly they sold £151 worth of coke, and paid £250 a year for coal to fire the boiler. This year they had spent only £50 on coal, because they had fired the boiler furnace with breeze and coke; and they had, down to last week, sold £754 worth of coke. But for the new plant, they would have been paying 5s. per 1000 cubic feet for gas, instead of 4s. 4½d. The Council unanimously adopted the recommendation of the Committee.

There have been further meetings this week, in both Falkirk and Hamilton, with reference to the questions regarding the gas supply which are agitating these communities. The Falkirk question is much the larger one. The electors of the Middle Ward met on Thursday evening to hear the views of their representatives in the Town Council upon the resolution which was adopted last week, condemnatory of Parkhouse as a site for the new gas-works. Only one of the representatives—Treasurer Mitchell—is in favour of the Parkhouse site; and he had to stand a long course of severe heckling. Mr. Russell said that in his search for information upon the subject, he had come upon the blackest chapter in the history of the town; that, as a matter of fact, previous to the ground at Parkhouse being scheduled there was never a man put upon it to examine it; and that the ground was selected in an Edinburgh lawyer's office, being simply taken from the Ordnance survey. These are weighty remarks, and should surely lead to inquiry of the most searching description as to the suitability of the ground. Much was made of the fact that the wire-rope guided gasholder which has been erected at Parkhouse had subsided upon the north side about 9 inches. It is said to be plumb—or level—now; but an elector maintained that it is still 3½ inches wrong. After a long discussion, a resolution was adopted by the meeting calling upon the Town Council, in view of the opinions obtained from experts, and of the probable danger to life in the erection of gas-works there, and the great expense which such a dangerous and uncertain experiment would entail, to abandon the Parkhouse site, and also to take into consideration the present state of the gasholder on that site, in order to secure the safety of the public.

In Hamilton, the meeting was called by Provost Keith, because he had been refused permission to address the meeting last week. He gave his version of the negotiations which have taken place with reference to the construction of a railway siding into the gas-works—a very fair statement indeed. The complaint of the objectors, so far as I can make out, is that they were not consulted until the business was fixed. This is a cry which has been often raised; but I think the good sense of communities generally recognizes that where properties require to be purchased there must be secrecy, and when the scheme is disclosed, if on the merits it is feasible, it is adopted. It is difficult, on the facts stated, not to be convinced that this siding would be of great advantage to the Corporation, and that the opponents have very small cause for the course they are following. The councillors who oppose the scheme, however, have large support in the community. At the meeting this week, in a crowded Town Hall, only about twenty persons supported the action of Provost Keith; and by a sweeping majority a resolution was adopted emphatically protesting against the proposal to construct a siding into the works, on the ground of its imminent danger to the lieges. Following up this resolution, the victorious party have called a special meeting of the Town Council to consider a motion to rescind their resolution to proceed with the siding, or, in the event of the Council not rescinding, to consider a proposal for a poll of the ratepayers being taken.

In the Lanark Town Council this week, a letter was submitted from the Secretary of the Gas Company, asking the Council to pay £32 12s. 3d.—the sum paid in the current year by the Company for repairing gas-pipes which had been broken by the road-roller, and also asking payment of an almost similar amount incurred in the same manner in the previous year. The Town Clerk said he had acknowledged receipt of the letter, and had intimated that the Council denied liability. This action was approved by the Council.

At their meeting last week, the Dumfries Town Council had presented to them a report by Mr. G. Malam, the Gas Manager, in which he requested to be allowed to incur further outlays to the amount of about £1600. The rock in the tank of the new gasholder, it was stated, had been expected to be of such hardness that it would take on cement; but it had been found to be soft and loose, and therefore brick lining would have to be resorted to, which would entail an extra expenditure of £250. Enlarged mains would require to be laid, at a cost of about £300; a larger station meter, to pass 50,000 cubic feet per hour, would require to be procured, at a cost of £600; and a new governor was

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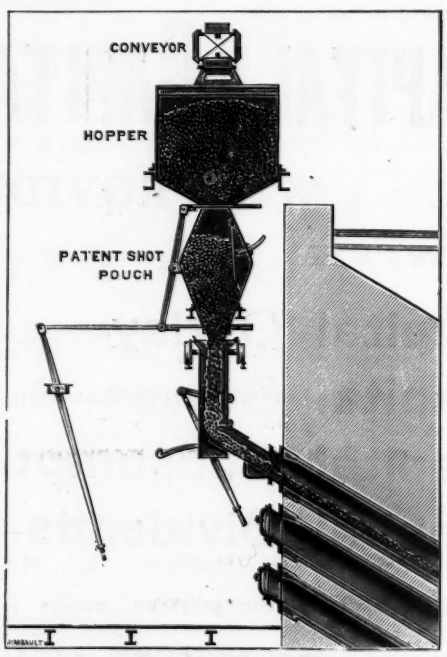

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necessary, the cost of which would be £180. He suggested that a new house for the governor and meter should be erected near the new gas-holder, at a cost of about £350. Mr. Malam stated emphatically that the extensions he suggested were absolutely necessary, and should be carried out without delay, so as to be ready for next winter. The Gas Committee recommended approval of the suggestions. Bailie Houston asked if they were near the end of the proposed expenditure upon the gas-works; and, in reply, Mr. Currie, the Convener of the Committee, reminded the Council that they were told by the Manager a year ago that they would require to expend £15,000, and they had only got the length of £8000 as yet. There was a strong feeling in the Council against the hasty adoption of the report; and in the end, Mr. Currie, with a mild protest, agreed to give time for further consideration of the various matters proposed.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 14.

Sulphate of Ammonia.

The week opened with a firm market and hardening prices, and the demand being well sustained, there was a sharp advance towards the close—the quotations being £12 17s. 6d. per ton f.o.b. Hull, and £13 per ton f.o.b. Liverpool and Leith. Spot prices have also been readily obtainable for April delivery, but for May and June buyers' views have been at 2s. 6d. to 5s. per ton discount. The advance has stimulated the interest of consumers, but they have scarcely kept pace with the market, and have consequently had only a small share in the buying. For delivery further ahead, there has also been some buying, £12 5s. and £12 7s. 6d. per ton have been successively paid for July-December delivery f.o.b. Leith.

Nitrate of Soda.

This article is firm at 9s. 3d. to 9s. 4½d. per cwt., with a good business passing.

LONDON, *March* 13.

Tar Products.

The markets generally remain quiet. Pitch is decidedly weak, especially for forward delivery. Several parcels are offering in the market; but consumers are not inclined to purchase, except at a considerable reduction on present prices. There is still a fairly good demand for prompt; but the market is certainly easier all round. The exports of patent fuel from South Wales show an enormous falling off during the last two months as compared with the same period of 1902. Benzol is still very dull. Business is reported in 90 per cent. at 9½d. April-June at an outport; but an offer of this price, by English consumers, was declined. In 50-90 per cent. there is nothing doing; the nominal value being 8d. to 8¼d., according to position. In toluol, a little business is reported at 7d. for ordinary, prompt delivery. In anthracene, some small transactions are reported; but it is generally believed that negotiations are pending in "A" quality for forward delivery with some of the German consumers. A little business has been done in solvent for home consumption, but at a very low price and for special qualities. Crude carbolic is in very good demand indeed, and 1s. 6d. is being freely paid for prompt delivery. At this price, business is reported at outports. As a rule makers ask 1s. 7d. for April-June; but consumers are not anxious to purchase for forward delivery. In crystals, the demand continues very good, but at present the Germans are accepting low prices. There is a strong demand for creosote in London for export; but in the North business is quiet, and prices have rather a downward tendency.

The average values during the week were: Pitch, London, 58s. to 59s. 6d.; east coast, 56s. to 57s.; west coast, 54s. to 55s. Benzol, 90 per cent., 9¼d. to 9⅜d.; 50-90 per cent., 8d. to 8¼d. Toluol, 7d. to 7¼d. Crude naphtha, 3¼d.; solvent naphtha, 8¼d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1 5/16d.; North, 1¼d. to 1⅜d. Heavy oils, 2d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 6d. Naphthalene, 35s. to 55s.; salts, 25s. to 27s. 6d. Anthracene, "A" quality, 1⅝d. to 1¾d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is very firm indeed, and there is a strong demand in all quarters. Having sold at £13 for April, Beckton have now raised their price to £13 2s. 6d. for May, and have none to spare for April As regards forward delivery, they do not care to quote a price. Another large London Gas Company accepted £13 for delivery to the end of April. In Leith, there is a strong demand, and makers report a scarcity of supplies. Business is reported during the week at £12 17s. 6d. and £12 18s. 9d., and makers now ask £13. In Hull, the demand has been scarcely so strong. Business was reported early in the week at £12 12s. 6d.; while at the end of the week £12 15s. has been paid in more than one instance. In Liverpool, the market continues strong; but there is not quite so much demand for prompt delivery, and it is difficult to fix the exact value at this port.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Generally there has been very little real apprehension among coa representatives in this district that the Miners' Federation would force matters to what the Daily Press has talked of as "a crisis in the coal trade" in connection with the South Wales wages settlement. When it became known that the conference in London last Tuesday had been unable to come to any definite decision, it was felt that the whole matter, notwithstanding the voting in the various districts in

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favour of a strike, would in some way be allowed to slide; and the result of the adjourned conference in London on Friday to a large extent confirms this view of the situation. The Miners' Federation evidently does not like to assume the responsibility of inaugurating a general stoppage of work; and while it cannot endorse the agreement entered into by South Wales, it practically throws upon South Wales the onus of any further development, which is not likely to be a resort to a strike. The general trade position throughout this district remains without improvement—the tendency, if anything, during the past week having been in the direction of a further slackening demand. Certainly the possibility of any general labour trouble rising out of the action of the Miners Federation with reference to the three years' South Wales settlement has not been viewed with any sufficient apprehension to cause anxiety on the part of either merchants or consumers to purchase in any large quantity for forward delivery, with the object of protecting themselves against contingencies. In all descriptions of round coal, business has continued to drag on slowly, with collieries getting gradually on to lessened time—three to four days per week becoming more and more about the average, and it has been exceptional where pits have been able to put in five days, which is practically regarded as full time. The chief difficulty with collieries is, of course, the better qualities of round coal used for house-fire purposes. There is a good deal of surplus coming on the market, which is offered in clearance lots at special quotations, which tends to weaken the position; and unless there is to be some very radical change in present conditions, an early official reduction in prices is looked upon as more than probable. The present quoted rates remain unchanged; but there is a tendency to ease down from the maximum figures. At the pit-mouth, the best qualities of Wigan Arley scarcely average more than 14s. up to 15s. per ton, with commoner sorts of Arley and Pemberton four feet from 12s. and 12s. 6d. to 13s., and the lower qualities of round coal about 10s. to 11s. There is a good deal of coal coming in from other districts at considerably under these figures; and in outside markets the competition for business is exceedingly keen. A fairly steady business is passing through in the commoner qualities of round coal suitable for steam and forge purposes; but prices are becoming difficult to maintain, owing to the competition of surplus common house-fire coal, which is now being quoted for iron-making, steam, and general manufacturing purposes, and the present state of the market promises to put a severe test upon prices when the gas coal and locomotive fuel contracts come forward for renewal and settlement. At the pit-mouth, the general quotations for ordinary descriptions of steam coal remain about 8s. and 8s. 3d. up to 8s. 9d. and 9s. per ton. Extremely low prices continue to be quoted for surplus lots of common coal that can be disposed of for shipment; unscreened coal being readily obtainable at about 8s. 6d. per ton, and screened coal from 9s. 3d. to 9s. 6d., with 10s. quoted for specially good qualities delivered at the ports on the Mersey. Slack maintains a strong position, owing to the continued restricted quantity of round coal being screened. Prices are strongly held to at about 6s. 6d. to 7s. per ton at the pit for the best qualities, 5s. 6d. to 5s. 9d. for medium, and 4s. 3d. to 4s. 9d. for the common sorts.

Northern Coal Trade.

Though the demand for coals is still unequal, it is a little better than it was, and the shipments are fuller; the collier-steamers having arrived more freely. In steam coals, the abatement of the American demand has made the markets rather weaker, and best Northumbrian steams are 10s. 3d. to 10s. 6d. per ton f.o.b., second-class steams 9s. to 9s. 3d., and steam smalls firm at about 5s. 9d. The collieries have worked fairly well for this period of the year. As to gas coals, full quantities for this time of the year are being taken up, so that the collieries are working well; but the stocks are believed to be increasing with the great companies. For occasional cargoes, the price of Durham gas coals is from 8s 3d. to 9s. per ton f.o.b., according to quality. Where there are contracts for export, it is probable that the price is between the two figures named; but it is clouded by the inclusion of the freight, which varies much. Nothing has yet been done as to the great contracts for the Metropolitan district. The price of gas coke, with a lessening output, is steady, and the quotation at Newcastle is from 12s. 6d. to 13s. per ton f.o.b.

Scotch Coal Trade.

The market is very quiet—inquiries for forward delivery being few for this season of the year. There is every prospect that, if the miners continue to work as steadily as they have been doing, there will soon be a reduction in the price of coal. At the present moment, the supply is more than equal to the demand. The prices quoted are: Main 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow, ell 9s. to 10s., and splint 9s. 9d. to 10s. The shipments for the week amounted to 193,047 tons—an increase of 47,362 tons upon the previous week, and of 693 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,675,288 tons—an increase of 43,314 tons upon the same period of last year.

General Gas Lighting and Heating Company of Belgium.—The last report presented to the shareholders of this Company sets forth that the position of the undertaking at the close of the past financial year (Aug. 31, 1902) was as follows: Length of mains, 804,586 metres; number of consumers, 24,454; street-burners, 15,634; private burners, 258,020; stoves and ranges, 19,774; and gas-engines equal to 5253¾-horse power. The gas sold during the year was 27,424,873 cubic metres, or about 970⅜ million cubic feet; being an increase of 1,092,413 cubic metres, or about 38½ million cubic feet. A new concession has been obtained for 35 years at Malo-les-Bains for gas and electricity; and one at Dunkerque for an electric supply. The total profits amounted to 1,607,938 frs. (£64,318); and the dividend per share was 40 frs., or at the rate of 8 per cent.

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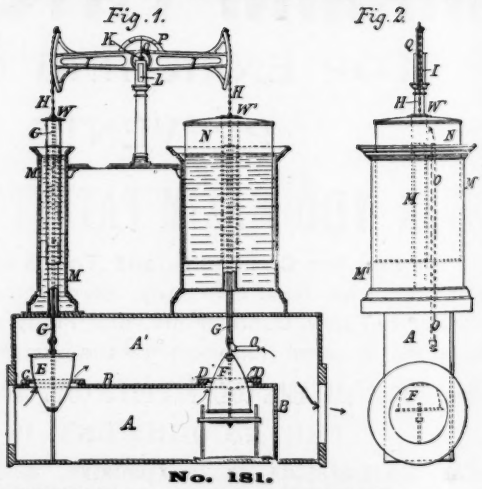

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Opposition to the Crystal Palace Gas Bill.—The Penge Urban District Council have decided to join with the other Local Authorities concerned in opposing the Bill promoted by the Crystal Palace District Gas Company, by which, among other things, authority is sought to reduce the illuminating power of the gas. It is understood that the opponents do not wish to defeat the Bill altogether; but they will endeavour to have some regulation introduced in regard to the quality of the gas supplied for cooking and heating purposes.

Horley District Gas Company.—The accounts of this Company for the six months ending the 31st of December, which were presented at the recent half-yearly meeting of shareholders, showed a very substantial increase in the business and profits during that period. The Company made 28,478,000 cubic feet in gas in the entire year, and sold 12,428,000 cubic feet in the second half of it to private consumers, producing a revenue of £2755. The total receipts were £3805, and the expenditure was £2756; the balance carried to the profit and loss account being £1049. After paying interest on the debentures and on a temporary loan, a sum of £590 was available for distribution; and a dividend at the rate of 6 per cent. per annum, less income-tax, was declared. This left a small balance to be carried forward. The position of the Company has greatly improved of late; for whereas the capital a few years back was upwards of £2500 per million cubic feet of gas made, it is now only about £1450.

Incandescent Gas Lighting for Ventnor Pier.—At the last monthly meeting of the Ventnor District Council, two tenders by the Gas and Water Company, relating to installations of incandescent gas lighting, were under consideration. One was for gas-fittings for lighting the wind-screens on the pier; and these the Company undertook to supply for £12 4s. 8d., and to keep the incandescent lamps in repair for 3d. per lamp per month. The Pier Committee recommended the acceptance of this tender, provided the Company would undertake the work for three years. Mr. Black, in moving the adoption of the proposal, said the cost of the installation of the electric light was so great that the Committee could not see their way to advising the Council to adopt it. It was mentioned that by the new system the consumption of gas would be 4 cubic feet, instead of 7 cubic feet as with the old, while they would have fifty times more light. The Chairman (Mr. T. Gibbs) remarked that nothing could exceed the willingness of the Company's Manager (Mr. J. S. Ineson) to meet the Council in every way; and he added that the electric lamps came to four times as much as the new lamps were estimated to cost. The recommendation was adopted. The other tender was for supplying and fixing 36 "Ventnor" lamps round the body of the pier, at a cost of £2 3s. 5d. per lamp, and keeping the burners, mantles, &c., in repair at 3d. per lamp per month. The Committee advised the acceptance of this tender, provided the Company would undertake the work for three years, and accept half the payment on completion, and the other half six months hence. This was agreed to. Mr. Ineson is to be congratulated on having scored a triumph for incandescent gas lighting; and he is rewarded for the trouble he took in having lamps specially made to suit the situation.

London County Council and Gas-Testing.—At the meeting of the London County Council last Tuesday, the report of the Parliamentary Committee given in the "JOURNAL" for that day (p. 645), setting forth the reasons for the action of the Committee in asking the President of the Board of Trade to appoint a Departmental Committee to consider the question of gas-testing in the Metropolis, was approved.

Accidental Over-Pressure of Gas at Lancaster.—Much inconvenience was caused at Lancaster shortly before one o'clock on Monday last week, by a considerable increase in the pressure, which had the effect of blowing the water out of a large number of meters, and cutting off the supply of gas. Owing to some alterations in the mains on the works, Mr. Armitage, the Gas Engineer to the Corporation, had fitted up a temporary arrangement for keeping up the pressure in the town. By some mischance, in the dinner hour the valve was turned too far, with the result above stated. The mistake was quickly detected, and the meters were attended to by a full staff of inspectors.

Slot-Meters Robbed by Bogus Inspectors.—Householders in Birmingham are being warned against a man who, by impersonating a fitter from the Gas Department, is rifling the prepayment meters in various parts of the town. As is usual in such cases, the man's stock-in-trade is audacity. He first of all states that he has come to examine the meter, about which there has been some complaint. If it is denied that any complaint has been made, the thief generally manages to find some other excuse, upon which he is allowed access to the meter. He is dressed as a gas-fitter; but, of course, he has not with him the books or official instructions which the men employed by the Gas Department carry.

Lectures on Coal Gas at Dunfermline.—On the evenings of the last two Saturdays, Mr. R. Somerville, B.Sc., of Dunfermline, has delivered lectures in that town, under the auspices of the Dunfermline Co-Operative Society, upon "Coal Gas." Specimens of coal were on view, which had been presented by Messrs. James M'Kelvie and Co., of Edinburgh. Coal gas was made in a model works which had been lent by Mr. H. O'Connor, of Messrs. James Milne and Son, Limited; and specimens of woollen goods dyed by coal tar dyes, which had been furnished by Messrs. Read Holliday and Sons, Limited, of Huddersfield, were shown. The exhibition of a number of gas meters, lamps, and fittings formed part of the programme.

Fighting the Gas Trust in New York.—According to a telegram, dated Thursday, to the "Morning Leader," the officials of New York City have begun a serious war with the Gas Trust. "The press and the public have for months been pounding this Corporation with lawsuits. They have proceeded against it for supplying poor gas, for overcharging, and for turning the gas off and on without warning, and thus causing deaths by asphyxiation. These have been in vain. Finally to-day the Finance Committee of the Board of Aldermen have appropriated £10,200 for the supervision of the gas supply in the public interest. The Gas Trust officials declare that they will fight to prevent the city from interfering with their business."

此等の料理器械は自在火口付きて器
械の諸部分は皆取り替ることを得べし
特に輸出に適当のものなり
特別直段のお問合せんことを願上候

WILLEY & CO.,
EXETER,
ENGLAND.

Incandescent Gas v. Electricity at West Bromwich.—On Monday last week the West Bromwich Corporation started an interesting experiment. With the view of ascertaining which will prove the more effectual and the cheaper means of illuminating the streets, two lights have been placed on ten of the centre poles bearing the trolley wires, ten being incandescent gas and ten electric; and it has been decided to run them in competition for three months. The general opinion, so far as the best illuminant is concerned, is that the incandescent gas is distinctly superior to the electric light.

The Gas Explosion at Maidstone.—At the meeting of the Maidstone Town Council in Committee on Wednesday, the question of the repair of the West Borough Bridge, which was seriously damaged by the gas explosion which occurred in that town last November, was considered; and the result of a meeting between the Mayor (Alderman W. Day) and the Chairman of the Gas Company (Mr. George Marsham, J.P.), with a view to an amicable settlement of the question of liability, was reported. The Company had obtained the offer of a local firm of builders and contractors to execute the repairs for a sum of £548; and, upon this basis they offered the Corporation £500 in full settlement. The Committee resolved to recommend the acceptance of this offer.

Reading Gas Company.—The accounts presented at the recent half-yearly general meeting of this Company showed that in the six months ending the 31st of December a sum of £30,226 was received from the sale of gas, £9853 from the sale of residuals, £658 from the rental of stoves, and £651 from service laying and fittings, incandescent fittings, mantles, &c.—the total revenue being £41,388. This was a distinct advance on the corresponding half of 1901, when the gas-rental was £28,318, the returns from residuals were £8973, and the stove-rental only £54—the total receipts being £37,345. In the past half year the manufacture of gas cost £24,681 (£18,115 being for coals), against £26,688 (of which £19,558 was for coals) in the second half of 1901; the total expenditure being £34,839, compared with £33,833. There were 182,130,000 cubic feet of gas sold to private consumers inside the borough, and 9,533,700 cubic feet outside, against 172,443,400 cubic feet and 7,589,600 cubic feet before. This increase is to a large extent accounted for by the extended use of prepayment meters; 1300 houses having been fitted up with these appliances in the period covered by the report. On these results, in the last half year of his management, Mr. H. E. S. Baker, the Company's Engineer, is to be congratulated. As already announced in our columns, he relinquishes his position on the 31st inst., and is succeeded by Mr. Douglas Helps. Full dividends for the half year were declared.

Messrs. F. C. Sugden and Co., of Leeds, have had orders placed with them for semi-deep regenerator settings by the Yeadon and Guiseley Gas Company, and for shallow regenerator settings by the Beccles Water and Gas Company. The former is a second repeat order.

"Municipal trading in Hornsey," says the "Local Government Chronicle," "has taken the form of the free sample system. The supply of electricity by the Urban District Council began in the week ending the 7th inst., and everyone who has been connected will have a free supply for a fortnight."

At the meeting of James Milne and Son, Limited, to-morrow, the Directors will have the unpleasant duty of reporting a loss of £4203 on the working in the past year; but as there was a balance of £1274 carried forward, the amount of the debit of the profit and loss account is £2929. The loss occurred chiefly in the Edinburgh portion of the business; the Glasgow and Leeds branches having, as formerly, yielded satisfactory results. The interim dividend on the preference shares paid in September last has been charged against the reserve funds, and the debit balance will be carried forward. The Directors regret that, in the circumstances, they are unable at present to recommend the payment of the final dividend on the preference shares.

At the ordinary general meeting of Messrs. C. & W. Walker, Limited, on the 6th prox., the Directors will report that the net profits realized on the trading in the year ending the 31st of January last amounted to £21,599. Adding the amount brought forward (£6149), a total of £27,748 is produced. Out of this, the Directors propose to pay a dividend at the rate of 5½ per cent. per annum on the preference shares for the six months ending at the above-named date, a dividend of 10 per cent. on the ordinary shares for a similar period, and a bonus of 2s. on each of the latter shares; adding £10,000 to the reserve fund (bringing it up to £25,000), and carrying £7548 forward. The machinery, plant, and buildings were kept in thorough working order last year out of revenue.

The twelfth annual general meeting of the Richmond Gas Stove and Meter Company, Limited, was held at Warrington on Thursday—Mr. T. Dwerryhouse (the Chairman) presiding. Before moving the adoption of the report, already noticed in the "JOURNAL" (*ante*, p. 658), the Chairman referred to the great loss the Company had sustained by the death of his predecessor, Mr. E. W. T. Richmond. He then dealt with the various items in the report and accounts, and concluded by expressing the opinion that, altogether, the past year had shown a decided improvement on 1901, which should be gratifying to the shareholders. The Vice-Chairman (Mr. H. M. Thornton), in seconding the motion, also alluded in feeling terms to the death of Mr. Richmond, whose loss was to him, he said, a personal sorrow, as it had been his privilege to have him as a friend many years before the Company existed. With regard to the working in the past year, he congratulated the proprietors on the result, more particularly when they considered that it was not a favourable year for gas stove and meter companies. He concluded by expressing the belief that when they assembled again in general meeting, the results shown would be better than those for the past year. The report was unanimously adopted. The Chairman then moved the declaration of a dividend at the rate of 10 per cent. per annum, free of income-tax, on the ordinary share capital. Mr. J. A. Ransome (Managing-Director of the Warrington works), in seconding the motion, pointed out that this was the eighth consecutive year in which they had paid 10 per cent. Referring to the cessation of profit-sharing, he said he had seen many of the employees personally on the matter, and, on the whole, they were well satisfied with what the Company had done for them. The motion was carried unanimously.

THE POSITIVE PREPAYMENT

IS PRE-EMINENT.

PRODUCED BY

SAWER & PURVES,

MANCHESTER.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

AGENT (Retort-House Specialities). Streets, London.
ASSISTANT-ENGINEER. Gloucester Gas Company. March 21.
CHIEF WATER ENGINEER. Glasgow Corporation. March 31.
DRAUGHTSMAN. R. & J. Dempster, Manchester.
DRAUGHTSMEN. W. J. Jenkins and Co., Retford.
MAIN AND SERVICE LAYERS (Cape Town). Cape Town Gas Company. London.

To Water Companies.

DIRECTORSHIP. N. P., care of Vickers, London.

Situations Wanted.

GAS-FITTER, &c. J. C., Poplar.
IN ENGINEERING WORKS BY YOUTH. No. 4003.
SUPERINTENDENT IN TAR WORKS OR CREOSOTING YARD. No. 4006.
TRAVELLER GAS-STOVE TRADE. W. W., Faversham

Plant, &c. (Second-Hand) for Sale.

BOILER, ENGINES (Steam and Gas), EXHAUSTERS, GASHOLDER, &c. Andover Gas Company.
CONDENSER. Redditch Gas-Works.
GAS ENGINE AND EXHAUSTER, &c. Lurgan Gas Company. April 6.
GAS ENGINES AND DYNAMOS. The "Don," Holborn Viaduct.
METERS (500 and 300 Light Wet). Longwood Gas-Works.
PURIFIERS ( ). Gas-Works, Lower Gornal.
PURIFIERS (3). Linlithgow Gas Company.

Plant (Second-Hand) Wanted.

AMMONIA STILL. No. 4005.
PURIFIER AND EXHAUSTER, &c. No. 4000.

Prepayment Meter Attachment for Disposal.

SCHOFIELD, ASHTON-UNDER-LYNE.

Meetings of Companies.

BRITISH GASLIGHT COMPANY. March 25.
EAST LONDON WATER COMPANY. April 2.

Sales of Stocks and Shares.

BARKING GAS COMPANY. March 28.
BRENTFORD GAS COMPANY. March 31.
CITY OF ELY GAS COMPANY. March 18.
CROYDON GAS COMPANY. March 18.
DORKING GAS COMPANY. March 24.
GRAYS GAS COMPANY. March 31.
HASTINGS AND ST. LEONARDS GAS COMPANY. March 18 and 31.
LEA BRIDGE GAS COMPANY. March 18.
LOWESTOFT WATER AND GAS COMPANY. March 18.
PORTSMOUTH WATER COMPANY. April 2.
REIGATE GAS COMPANY. March 31.
ROMFORD GAS COMPANY. March 24.
SWANAGE GAS AND WATER COMPANY. March 24.
WORTHING GAS COMPANY. March 24.

Mortgage Bonds.

SOUTH SHIELDS GAS COMPANY.

TENDERS FOR

Ammoniacal Liquor.

EAST ARDSLEY GAS COMPANY. Tenders by March 31.

Carbon.

TEIGNMOUTH GAS-WORKS.

Cast-Iron Columns.

LEICESTER GAS DEPARTMENT. Tenders by March 28

Coal and Cannel.

BROUGHTY FERRY GAS DEPARTMENT. Tenders by April 3.
CLONMEL GAS DEPARTMENT. Tenders by April 7.
DARLINGTON GAS DEPARTMENT. Tenders by March 19.
DARWEN GAS DEPARTMENT. Tenders by March 26.
WINDSOR GAS COMPANY. Tenders by April 7.

Fire-Clay Goods.

RHONDDA CORPORATION. Tenders by March 26.
TODMORDEN GAS DEPARTMENT. Tenders by March 31.

Fittings (Gas and Water), &c.

RHONDDA CORPORATION. Tenders by March 26.

Gasholder Tank.

ABERDARE GAS COMPANY. Tenders by March 20.

Gasholders.

ABERDARE GAS COMPANY. Tenders by March 20.
COPENHAGEN (Extension of Time to May 12.)

General Stores, Tools, &c.

RHONDDA CORPORATION. Tenders by March 26.
TODMORDEN GAS DEPARTMENT. Tenders by March .

Lime.

RHONDDA CORPORATION. Tenders by March 26.

Pipes and Fittings, &c.

SALFORD GAS DEPARTMENT (Welded Steel). Tenders by March 19.
TODMORDEN GAS DEPARTMENT. Tenders by March 31.

Retort Bench and Settings.

BEVERLEY GAS DEPARTMENT. Tenders by March 26.

Retorts.

TODMORDEN GAS DEPARTMENT. Tenders by March 3.

Steel Joists.

LEICESTER GAS DEPARTMENT. Tenders by March 28

Sulphuric Acid.

RHONDDA CORPORATION. Tenders by March 26.

Tar.

COLNE GAS DEPARTMENT. Tenders by March 31.
EAST ARDSLEY GAS COMPANY. Tenders by March 31.
LEEDS GAS DEPARTMENT. Tenders by May 9.
TONBRIDGE GAS COMPANY. Tenders by April 3.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined.
SPENT OXIDE purchased in any district.
JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON HOUSE,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications RE OXIDE to the COMPANY as above.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

NEW GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

EERSTE Hollandsche Yzererts Maaty
(First Dutch Bog Ore Company, Ltd.),
ROTTERDAM.
General Manager for England and Wales—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IT is worth your while to buy direct. THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.
H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

THE Eveson Coal and Coke Company, Limited, Birmingham, Ask for Prices of GAS COKE in any quantities, delivered into Waggons at Seller's Station.

TRAVELLER, with good connection in South Eastern Counties, lately representing good Firm, desires re-engagement. Excellent References. Age 27.
Address W. W., 83, Preston Street, FAVERSHAM.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE CEMENT, PAINT, GAS COAL.
BALE & CHURCH, 5, CROOKED LANE, LONDON, E.C.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

YOUNG Man (Age 27) requires Situation.
Experienced in Gas Fitting, Meter Reading, and Collecting Slot Meters. Good References.
Address J. C., care Mr. Baker, 13, Desart Street, POPLAR, E.

WATER COMPANIES.
AN Engineer, with several years' experience in managing a very successful Waterworks undertaking, is prepared to QUALIFY FOR A POSITION ON THE BOARD of Company where Expert Knowledge would be useful.
Address N.P., care of J. W. Vickers, 5, NICHOLAS LANE, E.C.

ADVERTISER (33) desires Position as SUPERINTENDENT in TAR-WORKS or CREOSOTING YARD. England or Abroad. Thorough practical experience in both branches. Good Fitter and Engineer. Excellent Testimonials and References.
Address No. 4006, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENTLEMANLY Youth, nearly 17, Educated at Whitgift Grammar School, Croydon, having good knowledge of Drawing (South Kensington Certificate), and attending classes in Mechanics and Electricity, desires to enter Engineering Works in London. Will give first year's services in lieu of premium.
Address No. 4003, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT-HOUSE SPECIALITIES.
WANTED, an Agent on Commission (Engineer preferred) for London and District. Must have Established connection among Gas Companies. Can be worked along with present business. Liberal Commission to suitable Agent.
Reply, stating Business, Connection, and References, to "Agent," care of STREETS, 30, Cornhill, LONDON.

WANTED, immediately, Draughtsmen used to Elevating and Conveying Plants.
Apply to W. J. JENKINS & Co., LIMITED, Gas Engineers, RETFORD.

DRAUGHTSMAN, accustomed to detailing and designing Gas-Works Apparatus, Wanted at once.
Apply, by letter, stating Age, Experience, and Salary, to R. & J. DEMPSTER, Limited, MANCHESTER.

WANTED for the Cape Town Gas Company, Two MAIN and SERVICE LAYERS; also good at Fitting. Salary £3 per week, Passage paid.
Apply, by letter, with *copies* of Testimonials, to CAPE TOWN GAS COMPANY, 35, New Broad Street, LONDON, E.C.

ASSISTANT-ENGINEER.

WANTED, by the Gloucester Gaslight Company, an ASSISTANT-ENGINEER.
Applications, stating Age and References, and giving full Particulars of training and past Experience, to be sent in not later than Saturday, the 21st inst., endorsed "Assistant-Engineer," to W. S. Morland, Gas-Works, Hempsted, near Gloucester.
Salary £130 per annum.

W. E. VINSON,
Secretary.

Gas Offices, Gloucester,
March 9, 1903.

GLASGOW CORPORATION.
(WATER DEPARTMENT.)

TO WATER ENGINEERS.

THE Corporation invite Applications for the position of CHIEF ENGINEER of their Water Department.
Applicants, beside possessing practical experience in all matters relating to the construction of Water-Works and the distribution of water, must be specially qualified to prepare Designs and Specifications for, and to supervise the construction of, such works.
Salary not to exceed £800 per annum.
The successful Candidate will require to devote his whole time to the duties of the Office.
Applications, stating Age and Experience, accompanied by 30 printed copies of not more than Six Testimonials, of recent date, marked "Water Department—Application for Engineership," to be lodged with the subscriber on or before the 31st curt.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
March 2, 1903.

WANTED, Ammonia Still (continuous system). Capable of treating effectively 50 to 60 Tons of Liquor per Twenty-Four hours.
Address, stating Particulars and Price, No 4005, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-METERS wanted, old disused Wet. Copper Lamp Frames, Brass, Pewter, Tin, Zinc, Lead Ashes, Old Copper Electric Cable, &c., for Cash.
J. SMITH, Canal Road, BRADFORD.

WANTED, a Second-Hand Purifier, 10 ft. square by 4 ft. 6 in. or 5 ft. deep, in good condition, with Valves and Connections; also a good Second-Hand EXHAUSTER, capable of passing 10,000 cubic feet per hour. Prices must be moderate.
Address, with full Particulars, No. 4000, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE (Second-Hand)—
One 500-Light WET METER and One 300-Light WET METER.
Apply J. H. BREARLEY, Gas Engineer, Longwood, HUDDERSFIELD.

FOR SALE—Two 14-Horse Power Crossley's GAS-ENGINES, and Two DYNAMOS by Royce, Manchester.
May be seen running by applying to the MANAGER, The Don, 27, 30, HOLBORN VIADUCT, E.C.

TO GAS METER MANUFACTURERS.

A SIMPLE, Reliable, and Positive Pre-PAYMENT ATTACHMENT for GAS-METERS to be disposed of on reasonable terms.
Address A. SCHOFIELD, 98, Dean Street, ASHTON-UNDER-LYNE.

GAS Plant for Sale, guaranteed perfect—
RETORT IRONWORK, modern and various.
BOILER, Cornish, 4 ft. 6 in. by 14 ft. 6 in., 70 lbs.
CONDENSERS, 4-inch, 6-inch, and 8-inch, and Patent types.
EXHAUSTERS and ENGINES in duplicate up to 12-inch Connections.
"LIVESEY" WASHERS up to 10-in. Connections.
"HOLMES" WASHERS, 10-inch or 12-inch Connections.
PURIFIERS, several Sets up to 20 feet square.
METERS and GOVERNORS, 4-in. to 12-in. sizes.
GASHOLDERS, 7000, 9000, 25,000, & 30,000 capacity.
All Plant supplied guaranteed good, sound, and satisfactorily erected. Catalogues of New Apparatus and References on application.
J.F.B. & Co. are the largest buyers of discarded Gas Apparatus.
J. FIRTH BLAKELEY & Co., Gas Engineers and Contractors, Thornhill, DEWSBURY.

FOR SALE—About 8 Tons of Retort CARBON. What Offers?
Address J. ALEX. GRAY, Gas-Works, Teignmouth, DEVON.

FOR SALE—Three Purifiers, 10 ft. by 4 ft. 6 in. by 3 ft., with 8-inch valves and Connections.
Address the MANAGER, Gas Company, LINLITHGOW.

THE Broughty Ferry Gas Council desire OFFERS for Scotch or English DROSS, Singles, Doubles, Trebles, &c.; also First-Class CANNELS and SHALES.

A BARGAIN—Water-Cooled Condenser in perfect condition. Capacity 25,000 cubic feet per 24 Hours.
Address A. E. LAYTON, Gas-Works, REDDITCH.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

PURIFIERS FOR SALE.

THERE are Four 8 feet Purifiers for Sale at the Gas-Works, Lower Gornal, near Dudley.
Particulars may be obtained from the MANAGER.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

GAS ENGINE AND EXHAUSTER FOR SALE.

THE Lurgan Gas Company have a 3½-Horse Power GAS-ENGINE and a 10,000 cubic feet EXHAUSTER, with Connections, all in good order, FOR SALE.
Proposals will be received up to Ten o'clock a.m., on Monday, the 6th of April, 1903, by

FRED. W. MAGAHAN,
Secretary.

FOR SALE—Very good Gas Plant as under:—
PURIFIERS—Four 12 feet square, with 8-inch Centre-Valve and Connections. Planed Joints.
Kirkham WASHER-S RUBBER, 300,000 cubic feet per diem., with Engine and 8-inch Valves and Connections.
Livesey WASHER, 250,000 cubic feet per diem, with 8-inch Valves and Connections.
Photos. sent on application to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of about 135 feet of 33-inch WELDED STEEL MAIN.
Full Particulars may be obtained on application to the Gas Engineer, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Steel Main," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 19th of March, 1903.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
March 11, 1903.

TODMORDEN CORPORATION.
(GAS DEPARTMENT.)

TO TOOL MERCHANTS, IRONMONGERS, &c.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for GENERAL STORES, WROUGHT-IRON TUBES and FITTINGS, TOOLS, &c., required by them during the Year ending March 31, 1904.
Full Particulars and Form of Tender may be obtained from the Engineer and Manager, Mr. Hy. Hawkins.
Tenders, endorsed "Tools and Fittings and General Stores," to be delivered at the Town Clerk's Office, Town Hall, Todmorden, addressed to the Chairman of the Gas Committee, not later than March 31, 1903.
The Committee do not bind themselves to accept the lowest or any Tender, and reserve the right to accept a portion of any Tender.

By order,
HY. HAWKINS,
Engineer and Manager.

TODMORDEN CORPORATION.
(GAS DEPARTMENT.)

TO RETORT AND FIRE-BRICK MANUFACTURERS, &c.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of the necessary RETORTS, FIRE-BRICKS, &c., also the RETORT-SETTING, required for the Year ending March 31, 1904.
Full Particulars and Form of Tender can be had on application to the Engineer and Manager, Mr. Hy. Hawkins.
Tenders, endorsed "Retorts, &c.," to be delivered at the Town Clerk's Office, Town Hall, Todmorden, addressed to the Chairman of the Gas Committee, on or before the 31st of March, 1903.
The Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to accept a portion of any Tender.

By order,
HY. HAWKINS,
Engineer and Manager.

BOROUGH OF BEVERLEY.

THE Gas Committee of the above Borough invite TENDERS for the Work and Material required in the erection of a RETORT-BENCH, and RETORT-SETTINGS on the Regenerative System, with all the necessary Furnace Fittings, Bench Mountings, &c.
Particulars can be obtained from the Gas Manager, Mr. F. W. Oldfield, at the Gas-Works, and Tenders must be delivered at my Office not later than the 26th of March, 1903, at Ten a.m.

J. WILLIS MILLS,
Town Clerk.

BOROUGH OF COLNE.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the surplus TAR made at their Works during the Twelve Months ending March 31, 1904.
Particulars may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tar," must be addressed to the Chairman of the Gas Committee, Gas-Works, Knotts Lane, Colne, Lancashire, and delivered not later than Tuesday, March 31, 1903.
The highest or any Tender not necessarily accepted.

FRED. THORPE,
Engineer and Manager.

Gas-Works, Colne,
Lancashire, March 6, 1903.

TENDERS FOR GAS COAL.

THE Directors of the Windsor Royal Gaslight Company invite TENDERS for 9000 Tons of High-Class GAS COAL, with option of taking 100 Tons per month in addition; to be delivered free to the Great Western Railway Station at Windsor during the Twelve Months ending the 30th day of April, 1904.
Deliveries to be made in such quantities and at such times as may be required by the Company.
Sealed Tenders, endorsed "Tender for Coal," to be sent by post to reach the undersigned by Tuesday morning, the 7th of April. Forms of Tender not supplied.
The Directors do not bind themselves to accept any Tender.

By order,
JOHN HENRY STRANGE,
Secretary.

2, Victoria Street, Windsor,
Berks, March 3, 1903.

BOROUGH OF DARWEN.

TENDERS FOR GAS SLACK.

THE Corporation are prepared to receive TENDERS for the supply of GAS SLACK for One Year, to be delivered at the Gas-Works Siding in the Corporation Waggons.
Forms of Tender and all Information as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.
Sealed Tenders, endorsed "Gas Slack," must be delivered to the undersigned on or before noon, Thursday, March 26, 1903.
No Tender necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, March 3, 1903.

CORPORATION OF LEICESTER.

SECTION No. 1, CONTRACT No. 74—
ROLLED STEEL JOISTS, &c.
SECTION No. 1, CONTRACT No. 75—
CAST-IRON COLUMNS.

THE Gas and Electric Lighting Committee of the above Corporation are prepared to receive separate TENDERS for the supply and delivery of ROLLED STEEL JOISTS and CAST-IRON COLUMNS, required at their Aylestone Road Works.
Drawings may be seen, and Specifications and Forms of Tender obtained upon application to the Engineer, and on payment of the sum of £5 (which amount will be returned upon receipt of a *bond-fide* Tender).
Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for ——," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, March 28, 1903.
The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E., M.Inst.E.E.,
Engineer and Manager.

Offices: Millstone Lane, Leicester,
March 12, 1903.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the supply of LIME, ACID, FIRE-BRICKS, GAS, WATER, and GUN METAL FITTINGS, OILS and PAINT, IRONMONGERY, BOOKS, and STATIONERY, &c., as may be required for the Year ending the 31st of March, 1904.
Also, for WROUGHT-IRON TUBES and LEAD and COMPO. PIPES for the Half Year ending the 30th of September, 1903.
Further Particulars and Forms of Tender may be obtained on application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, R.S.O., Glam.
No Form of Tender other than issued by the Council will be accepted.
The Contractors will be required to pay the Standard Rate of Wages recognized in the district.
Tenders, endorsed "Contract No. 1, 2," &c., as the case may be, addressed to the Chairman of the Gas and Water Committee, to be sent to the undersigned on or before Ten a.m. on Thursday, the 26th inst.
The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk.

Gas and Water Offices,
Pentre, R.S.O., Glam., March 10, 1903.

EAST ARDSLEY GAS COMPANY, LIMITED.

THE Directors invite Tenders for out- put of AMMONIACAL LIQUOR and TAR (about 150 Tons of each) for the ensuing Twelve Months.

Tenders to be addressed to the Secretary, TOM BROADHEAD, 8, Westgate, DEWSBURY, and to be sent in not later than the 31st inst.

NOTICE TO GASHOLDER BUILDERS.

THE Term for presenting Tenders for a 8 Million cubic feet GASHOLDER for the Copenhagen Gas-Works is extended until May 12, 1903, noon.

The LIGHTING DEPARTMENT OF COPENHAGEN, March 11, 1903.

TONBRIDGE GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of the above Company invite TENDERS for their surplus TAR for a period of Three Years from the 1st of July next.

Full Particulars can be obtained on application.

Sealed Tenders, endorsed "Tender for Tar," to be lodged with the undersigned not later than the 3rd of April next.

The highest or any Tender not necessarily accepted.

JAMES DONALDSON,
Engineer and Secretary.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 25th inst., at Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 14th and RE-OPENED on the 26th inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 4, 1903.

SOUTH SHIELDS GAS COMPANY.

ISSUE OF 3½ PER CENT. MORTGAGE BONDS.

THE Directors are prepared to receive APPLICATIONS for £10,000 MORTGAGE BONDS, at the above rate, less income-tax, in multiples of £100, for a term of not less than Three Years, repayable at any time after that period by a Six Months' Notice on either side.

Interest payable Half Yearly, on the 30th of June and the 31st of December in each year.

Applications will be accepted in the order in which they are received.

J. H. PENNEY,
Secretary.

Gas Offices, Chapter Row,
South Shields, March, 1903.

BARKING GAS COMPANY.

INCORPORATED BY ACTS OF PARLIAMENT 1867 and 1903.

SALE BY TENDER OF 1800 ORDINARY SHARES OF £10 EACH,

Entitled to a Maximum Dividend of Seven per Cent. per Annum.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL by TENDER, 1800 of the above, being a portion of Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of the Proprietors held on the 28th day of January, 1903, under the Powers of the above-mentioned Act.

Particulars and Conditions of Sale and Form of Tender may be obtained on application at this Office, and sealed Tenders must be sent in not later than Five o'clock in the afternoon of Saturday, the 28th day of March, 1903.

By order of the Directors,
STURT MORRIS,
Secretary.

Offices of the Company,
Gas-Works, Barking, Essex.

Third Sale, Water Order, 1902.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

IMPORTANT SALE OF NEW ISSUE OF SHARES in this Old-Established and Good Dividend-Paying Company.

HALL, PAIN, & GOLDSMITH beg to announce that they are favoured with Instructions from the Directors of the above-named Company to SELL BY PUBLIC AUCTION, at their Estate Sale Rooms, 57, Commercial Road, Portsmouth, on Thursday, April 2, 1903, at Seven o'clock in the Evening, in convenient Lots, the third portion of the New Issue authorized under "The Borough of Portsmouth Water Order, 1902," consisting of

2000 SHARES OF £5 EACH

(Fully paid), forming part of the New Ordinary Capital authorized under such Order.

The Auctioneers desire to call the special attention of Capitalists, Investors, and others, to this very favourable opportunity of securing shares in such a thoroughly sound Local Company.

The Shares will be sold *free of any Charges*, Fees, or Expenses whatever to the Purchaser.

Full Particulars and Conditions of Sale may be obtained, with any further Information, from the Secretary of the Company, J. L. WILKINSON, Esq., F.C.I.S., at the Company's Offices, Commercial Road, PORTSMOUTH; or of the AUCTIONEERS, at their Offices, 57, Commercial Road, PORTSMOUTH.

National Telephone, No. 401.
Municipal Ditto No. 514.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, March 18, a Two o'clock, in Lots, the following STOCKS and SHARES—

LEA BRIDGE DISTRICT GAS COMPANY,
£1000 CONSOLIDATED ORDINARY STOCK.

HASTINGS AND ST. LEONARDS GAS COMPANY,
£800 CONVERTED STOCK.

LOWESTOFT WATER AND GAS COMPANY.
70 £10 ADDITIONAL ORDINARY SHARES.

CROYDON COMMERCIAL GAS AND COKE COMPANY,
£500 "C" STOCK.

WORTHING GASLIGHT AND COKE COMPANY,
100 £10 ORDINARY SHARES.

CITY OF ELY GAS COMPANY,
£1070 ORIGINAL STOCK.

Particulars may be obtained of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

DORKING GAS COMPANY.

NEW ISSUE OF 120 £25 "D" SHARES.

MR. ALFRED RICHARDS will sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, March 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ROMFORD GAS AND COKE COMPANY LIMITED.

NEW ISSUE OF 640 £5 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SWANAGE GAS AND WATER COMPANY.

NEW ISSUE OF £5000 4½ PER CENT. PREFERENCE "WATER" STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

WORTHING GASLIGHT AND COKE COMPANY.

NEW ISSUE OF 300 £10 SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 24th of March, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

HASTINGS AND ST. LEONARDS GAS COMPANY.

NEW ISSUE OF £10,000 NEW ADDITIONAL FIVE PER CENT. ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 31, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

GRAYS GAS COMPANY, LIMITED.

NEW ISSUE OF 400 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 31, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of Mrs. Banks, deceased, and others.

THE BRENTFORD GAS COMPANY.

£2220 CONSOLIDATED STOCK.

THE REIGATE GAS COMPANY, LIMITED.

£500 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart E.C., on Tuesday, March 31, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

ABERDARE GAS COMPANY.

GASHOLDER AND STEEL TANK.

THE Directors of the above Company invite TENDERS for the erection of a THREE-LIFT GASHOLDER, of 150,000 cubic feet capacity, and STEEL TANK.

Copies of Specification, Conditions of Contract, and Prints of Plans may be had on application to Mr. Isaac Carr, M.Inst.C.E., Consulting Engineer, Farnworth, Widnes, on payment of two guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Gasholder," addressed to Benjamin Jones, Esq., Chairman, Gas Company, Aberdare, must be delivered to the undersigned not later than the 20th inst.

EVAN JONES,
Secretary and Manager.

Gas-Works, Aberdare,
March 6, 1903.

LEEDS CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corpora- tion of Leeds are prepared to receive TENDERS for the purchase and removal of the GAS TAR to be produced at their several Gas-Works during One, Two, or Three years, commencing at noon on the 1st day of September, 1903, either on the sliding-scale basis or at a fixed price per ton.

Full Particulars and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Tar," must be delivered at the Offices of the Gas Department, Municipal Buildings, on or before Saturday, the 9th day of May, 1903.

The Committee do not bind themselves to accept the highest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, Municipal Buildings,
Leeds, March 7, 1903.

CORPORATION OF DARLINGTON.

(GAS-WORKS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas-Works Committee of the above Corporation invite TENDERS for the supply of 35,000 Tons of freshly wrought GAS COAL, delivered at the Gas-Works Siding as required during the ensuing Twelve Months.

Further Particulars may be obtained from Mr. Frank P. Tarratt, Gas-Works Engineer, Darlington.

Tenders, endorsed "Tender for Gas Coal," to be delivered at my Office, Houndgate, Darlington, not later than March 19, 1903.

No pledge is given that the lowest or any Tender will be accepted.

(Signed) HY. G. STEAVENSON,
Town Clerk.

Town Clerk's Office,
Darlington, March 6, 1903.

CORPORATION OF CLONMEL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above-named Corporation are prepared to receive TENDERS for the supply of about 3000 Tons of Durham or any other good GAS COAL, free from Sulphur, Bats, Bind, Refuse, and Dirt; the Coal to be delivered in Waterford as required over the period between the date of declaration of the Contract and the 30th of June, 1904.

Tenders to state prices for delivery by steamers and sailing ships respectively; the latter to be discharged at the rate of 30 Tons per working day.

The Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any tender.

Sealed Tenders, endorsed "Tender for Gas Coal," to be delivered on or before the 7th of April, 1903, addressed to the Secretary, Gas-Works, Clonmel.

Gas Offices, Clonmel,
March 16, 1903.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday, the 2nd of April ensuing, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED from the 19th of March to the 8th of April, both days inclusive, and RE-OPENED on the 9th of April, on which days the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

15A, St. Helen's Place,
Bishopsgate Street, E.C.,
March 10, 1903.

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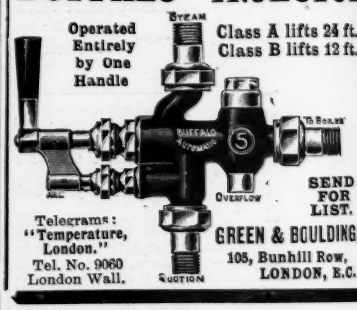

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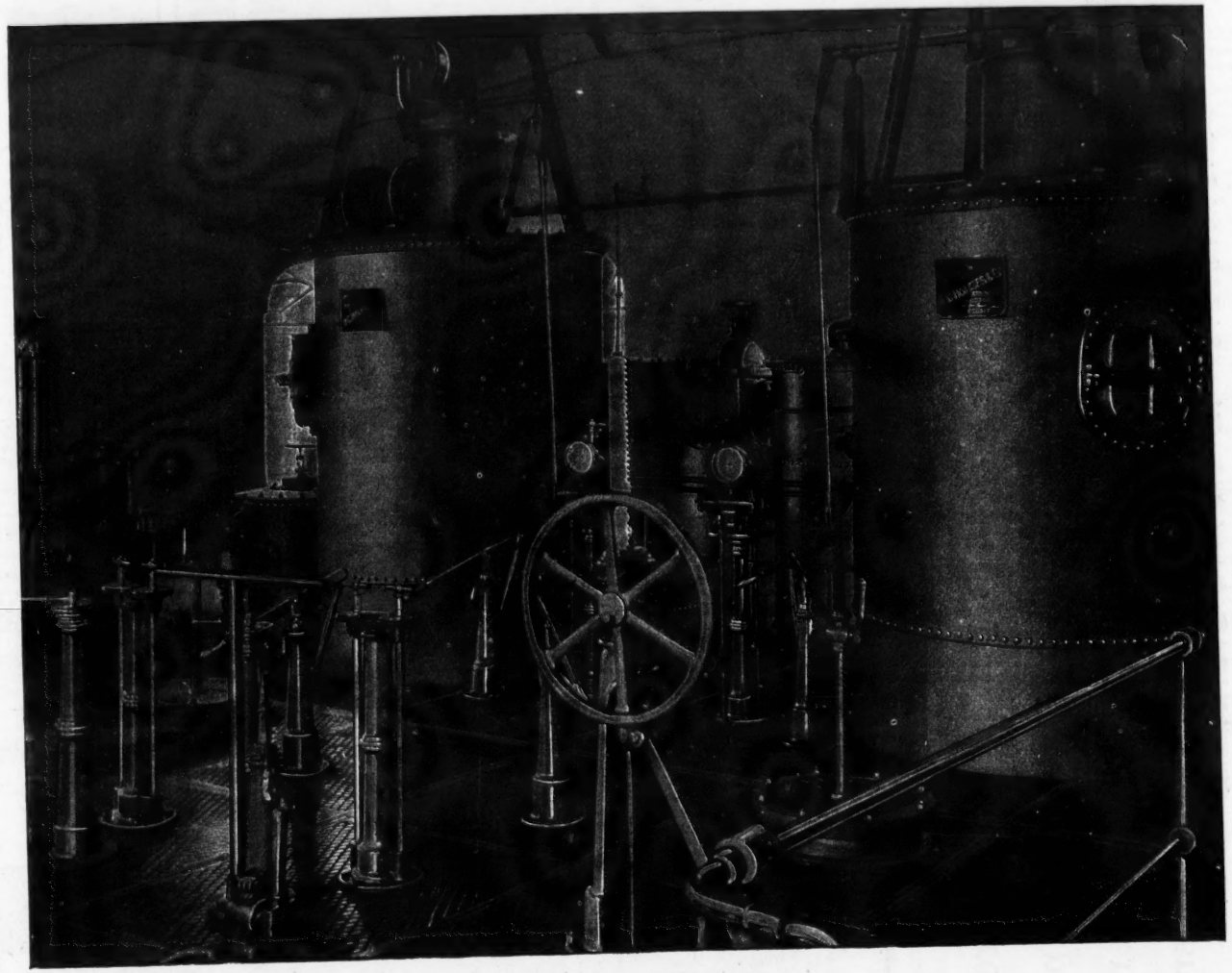

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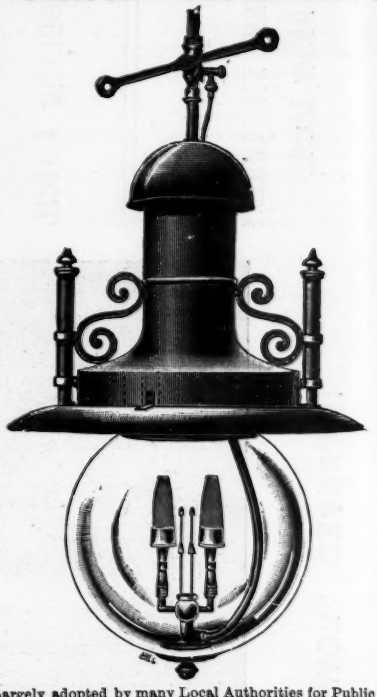

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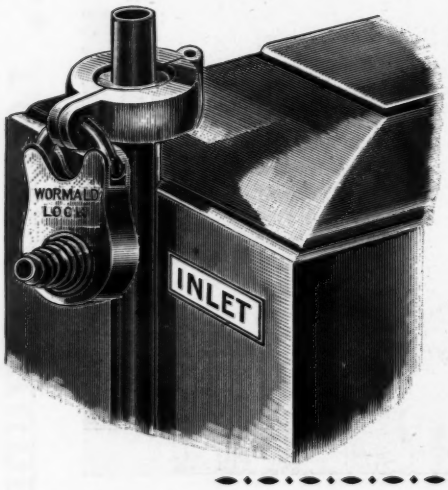

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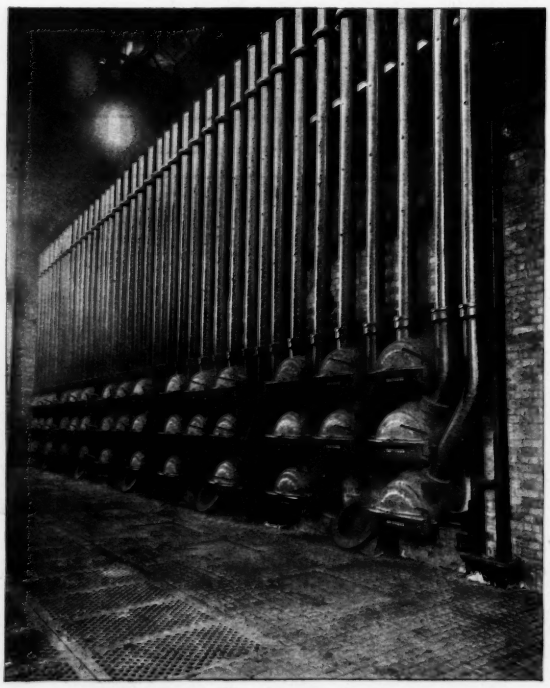

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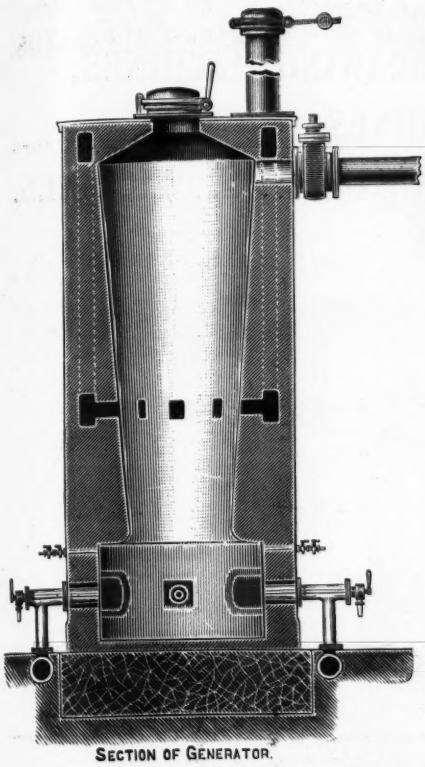

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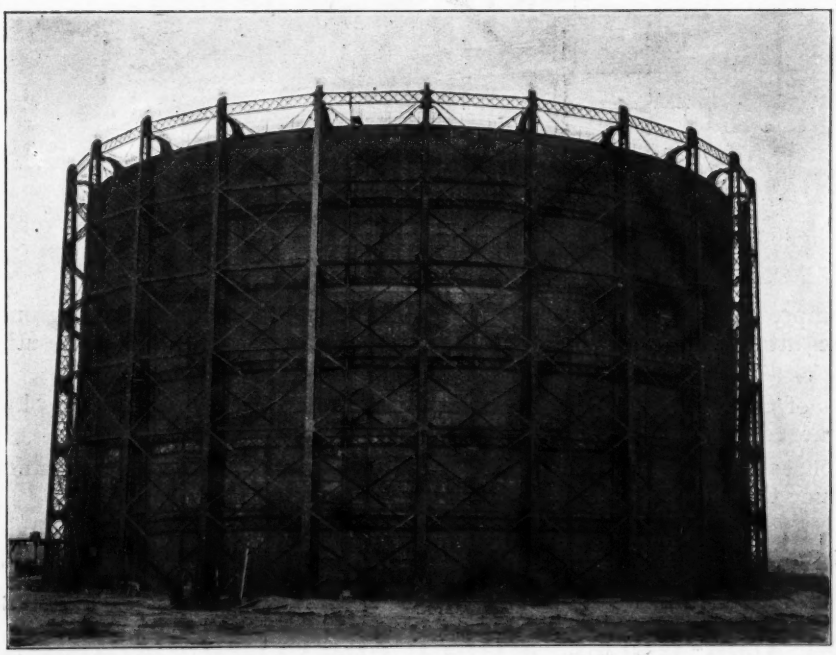

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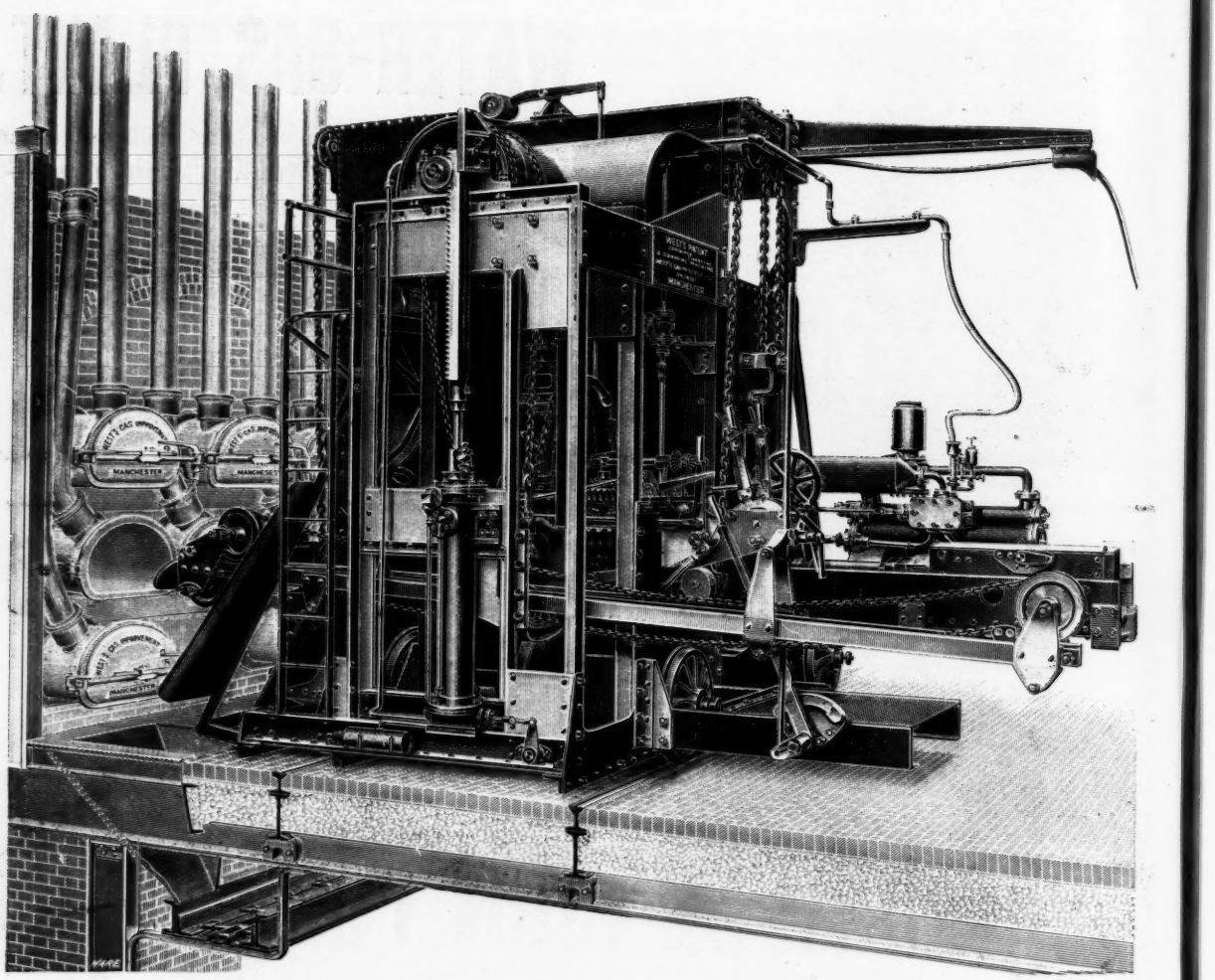

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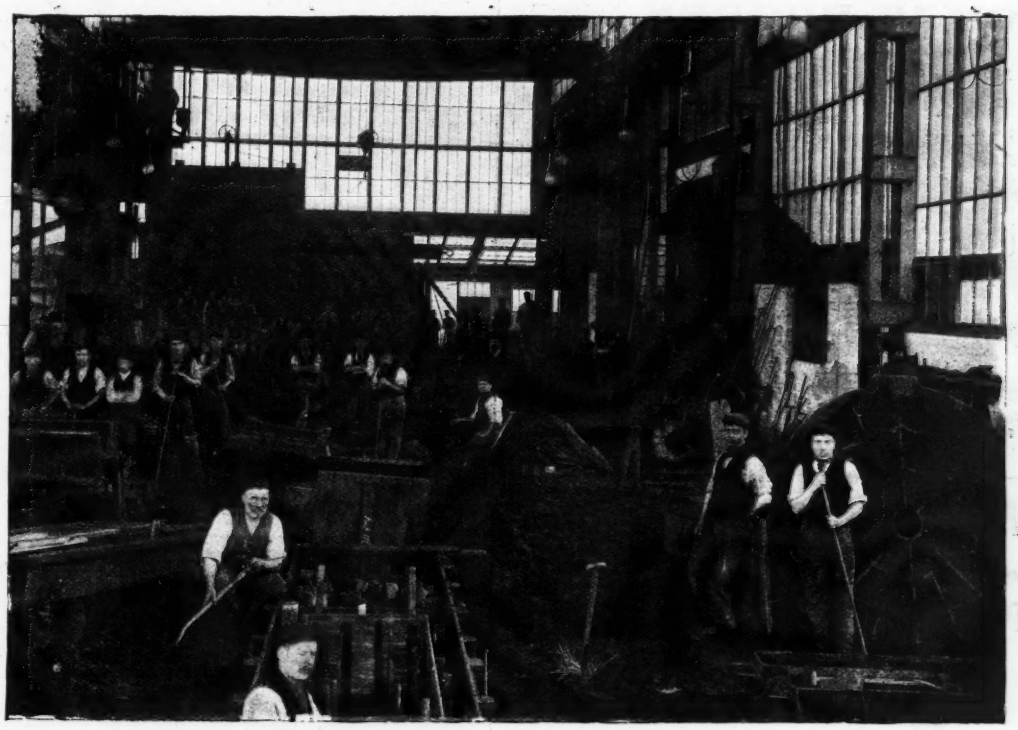

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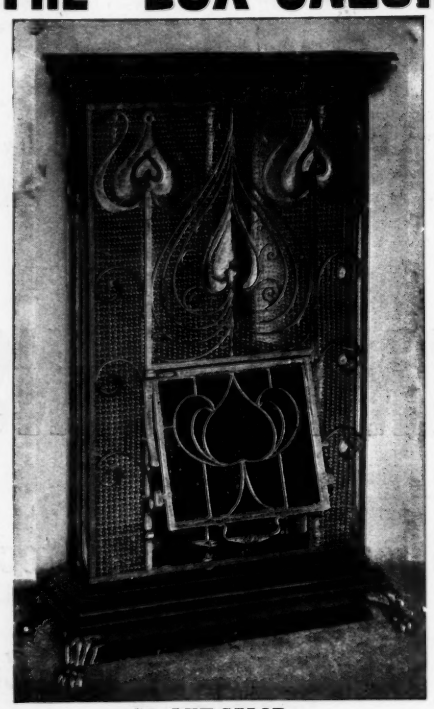

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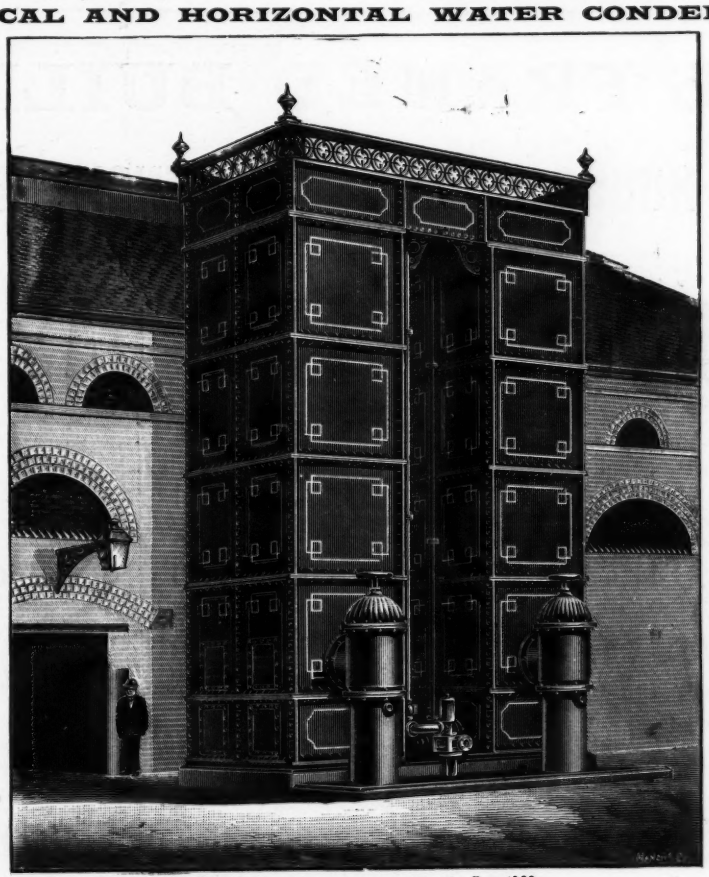

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